American Machinist

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EDUCATIONAL ORDERS as Unemployment Relief

AMERICAN MACHINIST recommends without reservation the passage of enabling legislation, as soon as the Congress meets in December, to authorize the Assistant Secretary of War to place so-called educational orders for munitions with private industry, and the appropriation of adequate funds to make them a factor in unemployment relief.

Such orders would provide at least a small amount of work for deserving toolmakers and machinists now laid off, and are entirely sound from the national defense point of view.

What these orders are and why they were proposed is covered in the article on the next page written by Assistant Secretary of War Payne, who is charged with the mobilization of American industry in case of an emergency.

Many meritorious projects for providing work for the unemployed have been proposed, but analysis shows that most of them will help only the unskilled in all fields, and the skilled in the field of civil engineering and construction. We have seen little that would help the men in the metal-working industries. The educational order, however, will provide employment in metal-working plants, and if placed now will be welcomed by the management because there is no flood of production of the regular product to be disturbed. These plants are concentrated, to a considerable extent, in the sections reported by Col. Woods to be hardest hit, the Lake States and the industrial centers.

If any relief is to be secured from this source, immediate action must be taken by the Congress when it meets. As will be evident from Secretary Payne's article, extensive hearings on a similar proposal have been held; the way should be clear for quick action. Unlike certain other relief projects, educational orders can be placed within a few hours after the enabling bill is signed.

Please give this proposal your careful consideration and write to your representatives in Congress urging their immediate and favorable action. The editors of *American Machinist* will be grateful for your comments on the proposal. If and when legislation is introduced you will be informed through our editorial columns so that you can follow up your representatives once more.

K. H. Condit

PUBLISHING DIRECTOR

By Hon. Frederick H. Payne
Assistant Secretary of War

THE EDUCATIONAL ORDER

A thoroughly sound and essential division of the plans for national defense, and a promising project for the immediate relief of unemployment . . . . . .

TWELVE YEARS ago last week the World War came to an end, and the citizens of the United States gave thanks that no more of their men would fall on French battlefields. At home, manufacturers of all the complicated machinery of modern warfare welcomed the relaxing of the tension of working against time with human lives at stake, and turned to face the almost equally difficult task of turning their equipment over to the making of the peaceful machinery of commerce and industry.

From a military standpoint the tragic feature of this situation lay in the fact that after a year and a half of nerve-racking effort, some manufacturers were almost ready for quota production of the items allotted to them, others were producing their quotas, and a few were in a position to exceed their quotas. In other words, American industry had finally learned how to make munitions, and there was no longer need of that knowledge.

It was discouragingly plain to the military authorities that the knowledge so painfully acquired would soon be forgotten by these men who were now struggling to find saleable products to make in their over-expanded plants. So thorough had been the economic devastation of the World War that it appeared that another conflagration within a generation would be extremely unlikely. By that time, if no steps were taken to keep alive the skill of munition making, new men would be at the heads of the plants to which the country must turn for its defensive equipment, and the whole wasteful process would have to be endured again. It was disquieting to think of what might happen during this period of preparation, a year to two years in length, if there should be no allies to bear the brunt until we could get ready.

Let us not forget that the numbers of guns and gun carriages of American manufacture that actually saw service before the Armistice were pitifully few. Or that the number of American-built airplanes that went over the lines was equally insignificant. We did our fighting with equipment purchased from our Allies.

Our arsenals, if properly equipped and maintained,

are adequate to supply our needs in peace times, to act as laboratories for the development of munitions manufacturing methods, to produce from 5 to 10 per cent of our wartime requirements. For the remaining 90 to 95 per cent we must depend on private industry.

But if it takes private industry from one to two years to get into production on items that are foreign to its experience—it took the Ford organization a year to swing over from Model T to Model A, a product with which it should be entirely familiar—how are we to prepare ourselves to meet an emergency?

The only promising prescription for this ill that has so far been presented is the educational order. Put forward some time after the Armistice by certain far-sighted individuals, it met with approval by all those who had had experience with the hectic hurry of munition manufacturing in 1917 and 1918.

WHAT is an educational order? I take it that most of the readers of *American Machinist* are more or less familiar with the expression and what it implies, but I have no doubt that some of the details may have escaped them.

To recall these details I believe I can do no better than to quote from a letter addressed to the Committee on Military Affairs of the House of Representatives by my distinguished predecessor, Hon. Dwight F. Davis.

Mr. Davis wrote as follows:

"The second paragraph of section 5a of the national defense act now reads: ' . . . He shall cause to be manufactured or produced at the Government arsenals or Government-owned factories of the United States all such supplies or articles needed by the War Department as said arsenals or Government-owned factories are capable of manufacturing or producing upon an economical basis.'

"The bill which was introduced and which I desire to be reintroduced reads as follows:

'A BILL to amend section 5a of the national defense act, approved June 4, 1920.

'Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the second sentence of the second paragraph of section 5a of the national defense act, approved June 4, 1920, be, and the same is hereby, amended by striking out the period at the end of the sentence, inserting a colon, and the following:

'Provided, That the Secretary of War may authorize the placing of educational orders for equipment, munitions, and accessories needed in the military service with commercial concerns to the degree that is considered by him as being necessary to familiarize commercial factories with munitions manufacture and to advance the industrial war plans of the War Department, and in placing these educational orders the competitive bids which in his opinion best secure these results may be accepted; and he shall make statement of his action under this provision in his annual report.'

"The change in legislation is desired to further industrial preparedness for war. In the consideration of industrial preparedness the following points are emphasized:

1. Modern war is a war of machines.
2. Modern war requires these machines in numbers heretofore undreamed of.
3. The capacity of Government arsenals for the manufacture of these machines is small compared with the volume required.
4. The industry of the country must make up the deficiency.
5. Modern industry is not familiar in time of peace with munitions manufacture.
6. Without this familiarity valuable time is lost when an emergency arises.
7. Much of this valuable time can be saved by placing educational orders for munitions with commercial concerns.
8. The placing of these educational orders will unquestionably add to national preparedness.
9. The slight increased cost is cheap national insurance.
10. The placing of these educational orders is not possible under existing law."

The applicable provisions of existing law on this subject are as follows:

> "Sec. 6190 R.S.—Purchases for various branches of Army service.—Hereafter, except in cases of emergency or where it is impracticable to secure competition, the purchase of all supplies for the use of the various departments, and posts of the Army and of the branches of the army service shall only be made after advertisement, and shall be purchased where the same can be purchased the cheapest, quality and cost of transportation and the interest of the Government considered. (Act March 2, 1901, c. 803, 31 Stat. 905)"

Section 5a of the national defense act:

". . . the Assistant Secretary of War . . . shall cause to be manufactured or produced at the Government arsenals or Government-owned factories of the United States all such supplies or articles needed by the War Department as said arsenals or Government-owned factories are capable of manufacturing or producing upon an economical basis."

I don't believe it is necessary to elaborate on the statement of Mr. Davis. Any man who has had manufacturing experience will see the problem at a glance.

AND now a bit of history. The proposed amendment was generally indorsed. A Senate bill embodying the necessary amendment to section 5a of the national defense act was introduced in 1926 but failed of passage.

Another bill embodying the same recommendations was introduced into the House of Representatives during the second session of the 70th Congress. Hearings were held before the Committee on Military Affairs in January, 1929, and the bill was reported favorably by the committee but was lost in the legislative jam at the end of that session.

Now comes an opportunity to press for consideration of this policy of educating industry by means of trial orders placed with plants that would be chosen for such work in an emergency. From the national defense point of view the policy is as sound as ever. In addition, we have in the educational order a splendid means of providing at least a small amount of work for skilled toolmakers and machinists who have of necessity been laid off because of business conditions.

There is this added inducement for immediate consideration. Managements of plants that are not fully busy will look more favorably on the educational order than they would if production were in full swing. The

educational order is not a profitable venture for the plant that accepts it. If anything more than the bare cost of tooling up and doing the work is returned to the plant, its executives will consider themselves fortunate. And the disruption of routine and the distraction of the attention of the personnel involved are not pleasant to contemplate when an organization is running to the full extent of its capacity.

On all these counts the proposal to authorize the educational order merits strong support, but particularly because it provides an immediate means of giving highly useful work to men who need and deserve it.

INDORSEMENTS BY DISTRICT ORDNANCE CHIEFS

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NBK 787 NPR DETROIT MICH 11
KENNETH H CONDIT. EDITOR AMERICAN MACHINIST
TENTH AVE AT 36 ST
HEARTILY ENDORSE YOUR EFFORT TO HAVE CONGRESS AUTHORIZE EDUCATIONAL ORDERS FOR MANUFACTURE OF ORDNANCE AND OTHER NONCOMMERCIAL MATERIAL NOT ONLY AS A CONSTRUCTIVE MOVE TOWARD EFFECTING INDUSTRIAL PREPAREDNESS FOR WAR AS OUR STRONG GUARANTEE OF CONTINUED PEACE BUT ALSO AS A DISTINCT BENEFIT TO THE UNEMPLOYMENT IN OUR FOUNDRIES AND MACHINE SHOPS WHICH NEED THIS LIFT FROM THE GOVERNMENT FULLY AS MUCH AS THE CONSTRUCTION INDUSTRY NEEDS THE STIMULATION RESULTING FROM AN EXPANDED PROGRAM OF PUBLIC WORKS STOP THERE IS EVERY SOUND REASON TO URGE THIS PROGRAM AND NO OBJECTIONS TO IT THAT I CAN SEE
COLONEL JAMES L WALSH
CHIEF NEW YORK ORDNANCE DISTRICT

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KB CLEVELAND OHIO 10 39 AM
NOV 11 1930
K H CONDIT
NY
REFERENCE WIRE ON EDUCATIONAL ORDERS I INDORSE PRINCIPLE AS OUTLINED BY LEGISLATION AND CONGRESSIONAL HEARINGS OF LAST YEAR
H C OSBORN
CHIEF CLEVELAND ORDNANCE DISTRICT

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PHILADELPHIA PENNA 1040 AM
NOV 11 1930
K H CONDIT
HAVING ADVOCATED THE NEED FOR A MODERATE APPROPRIATION BY CONGRESS TO COVER THE ISSUANCE OF EDUCATIONAL ORDERS TO MANUFACTURERS CAPABLE OF CERTAIN ORDNANCE PRODUCTION DASH THIS WHEN CONDITIONS WERE NORMAL DASH IT FOLLOWS THAT THE SAME RECOMMENDATION IS AGAIN IN ORDER BUT OF GREATER IMPORTANCE AT THE PRESENT TIME SINCE IT REPRESENTS AN ADDITIONAL RELIEF MEASURE FOR UNEMPLOYMENT WITH EVENTUAL ADVANTAGE TO OUR GOVERNMENT
JOHN C JONES
CHIEF PHILADELPHIA ORDNANCE DISTRICT

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TROY N Y 1250 P NOV 11 1930
MR K H CONDIT PUB DIRECTOR
MC GRAW HILL PUB CO 10 AVE & 36 ST
BUFFALO ORDNANCE DISTRICT HAS ALWAYS STRONGLY FAVORED THE PRINCIPLES OF EDUCATIONAL ORDERS AND BELIEVE THAT THEY ARE ESPECIALLY NECESSARY AND DESIRABLE AT THE PRESENT TIME BECAUSE OF BUSINESS CONDITIONS
COLONEL LEDYARD COGSWELL JR
CHIEF BUFFALO ORDNANCE DISTRICT

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K H CONDIT PUBLISHING DIRECTOR CARE AM MACHINIST
CARE MC GRAW HILL BLDG DELIVER 13 FLOOR 36 ST & 10 AVE
ENDORSE MOVEMENT NAMED AS IMPORTANT STEP IN INDUSTRIAL PREPAREDNESS
COLONEL C L HARRISON
CHIEF CINCINNATI ORDNANCE DISTRICT

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AM MACHINIST
AM WILLING TO ENDORSE THE ARTICLE BY SECRETARY WAR PAYNE ON EDUCATIONAL ORDERS
E A RUSSELL
CHIEF CHICAGO ORDNANCE DISTRICT

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K H CONDIT
HEARTILY ENDORSE CONGRESSIONAL AUTHORIZATION OF EDUCATIONAL ORDERS FOR ORDNANCE MATERIAL EITHER AS UNEMPLOYMENT RELIEF PROJECT OR AS INSURANCE
COLONEL B A FRANKLIN
CHIEF BRIDGEPORT DISTRICT ORDNANCE OFFICE

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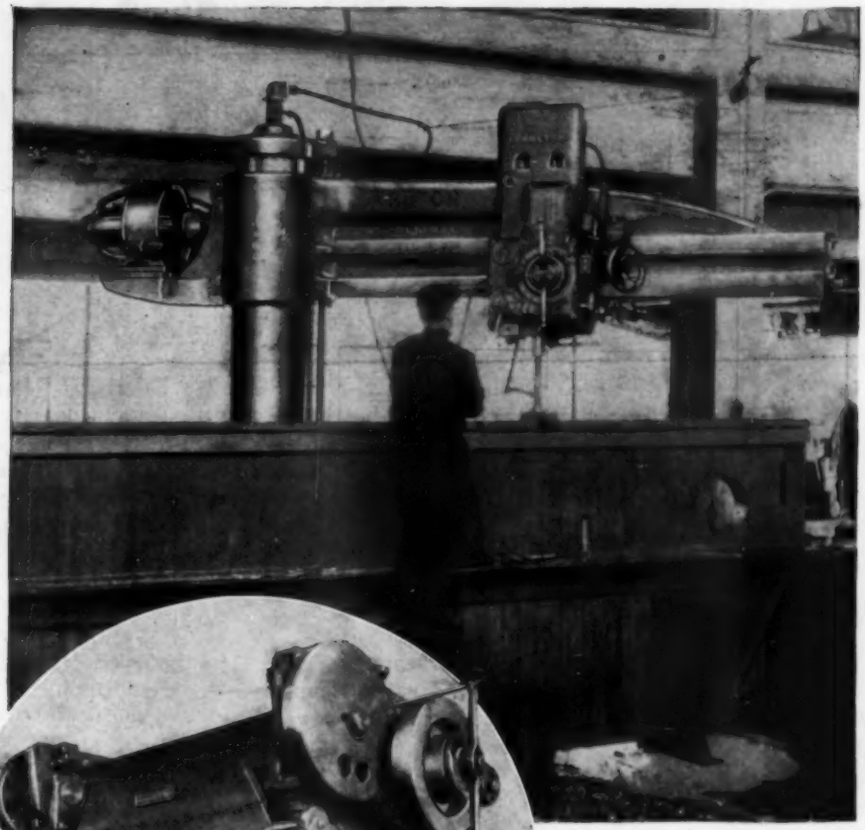
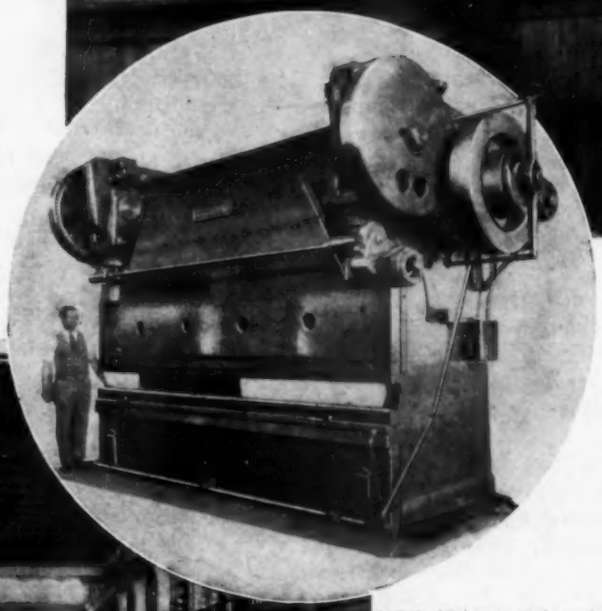
44 DI CS 165 WD
SAN FRANCISCO CALIF 100P NOV 12 1930
K H CONDIT
AMERICAN MACHINIST NYC NY
BECAUSE IT TAKES A YEAR LONGER TO EQUIP SOLDIERS WITH SOLDIERS TOOLS THAN IT DOES TO MOBILIZE AND TRAIN MEN TO BE SOLDIERS IT IS ONLY PRUDENT WISE AND FAIR THAT THIS NATION DO EVERYTHING REASONABLY POSSIBLE TO INSURE AGAINST SENDING UNEQUIPPED MEN INTO AN EMERGENCY STOP FOR THAT REASON I BELIEVE IN SUCH INDUSTRIAL PREPAREDNESS AS WE NOW HAVE AND I ALWAYS BELIEVED THAT IT SHOULD BE STRENGTHENED IN SEVERAL WAYS INCLUDING THE AUTHORIZATION OF EDUCATIONAL AND EXPERIMENTAL MANUFACTURING ORDERS STOP LEADING MANUFACTURERS OF THIS DISTRICT ASSURE ME THAT IN ORDER TO HOLD THEIR ORGANIZATIONS TOGETHER AND TO RELIEVE UNEMPLOYMENT SUCH ORDERS WOULD BE ACCEPTED AT FIGURES REPRESENTING BARE COST OF MANUFACTURE AND WITHOUT DIRECT PROFIT STOP THE PRESENT TIME OF SLACK EMPLOYMENT THUS SEEMS TO BE THE RIGHT TIME TO GET RESULTS ECONOMICALLY AND AT THE SAME TIME RELIEVE UNEMPLOYMENT STOP I AM DELIGHTED TO NOTE THAT SECRETARY PAYNE IS MOVING IN THIS DIRECTION AND THAT AMERICAN MACHINIST IS SECONDING HIS EFFORTS
COLONEL BRUCE CORNWALL
CHIEF SAN FRANCISCO ORDNANCE DISTRICT

Building Brakes From Plate



Drilling a bed plate—one solid piece of rolled steel plate 18 ft. long, 6 ft. deep, and 5 in. thick. The plates, as they come from the mill, are cut out with a pantograph, then planed all over and finish machined



The Cincinnati Series 190, 10-ft. bending brake, built of steel plate shape-cut and arc-welded. This 300-ton brake has a capacity of bending ½-in. steel 10 ft. long to a ½-in. inside radius

Brake housings being assembled lying on their "backs." Finish assembly is done over pits at the right

Photographs by courtesy of Cincinnati Shaper Company

EXECUTIVE FORUM

Home Work

"REMEMBER, 'all work and no play'—." Bill Holland had spent several hours at the Express Machine Company and on his way out had stopped in the chief engineer's office to see his friend, Ralph Cary. Cary was busy crowding his brief case with blueprints, sketches, and miscellaneous memoranda.

"What's the trouble—are they crowding you too hard?" asked Bill.

"No," said Cary. "Just the usual thing. We're plugging along the same as ever, but I find a little extra time is necessary—besides I can concentrate better away from the office."

"So it's a habit," said Bill. "How long has this been going on?"

"I've always done some work at home," said Cary, "but after I was made chief engineer last year, my additional duties made it more essential than ever."

"And what does your family think about it?" asked Bill.

"I guess they're used to it by now," said Cary. "Of course I don't work constantly—I usually try to have one or two nights a week free. And my work doesn't always keep me up late."

"It doesn't sound as though you're idling away your time," said Bill. "As near as I can see you're doing both yourself and your company an injustice. You've gotten yourself into a groove walled in with blueprints and specifications. There's a world outside of that. Do you play golf, bridge, go to the theater, or devote yourself to some outside hobby?"

"Not very often," Cary acknowledged. "My work here is both administrative and creative. To give my best effort to it, I've little time for outside interests. In fact, I encourage my assistants to do the same. I think a man who forgets his job as soon as the whistle blows is not entirely wrapped up in his work."

Bill shook his head. "I'm afraid your basic ideas are warped. Work isn't everything in life. There are art, literature, politics, sports, and a hundred other interests. Every man should make himself a well-rounded member of society. It may be all right to put extra time on your job when rushed, but it's all wrong to make it part of your daily schedule."

"Perhaps I have overdone it a bit," said Cary, "but after all, today is the day of the specialist. To succeed a man must know his subject thoroughly. I feel I owe my present position to my willingness to put work ahead of everything else. I have men working for me with just as much intelligence as I who are not willing to sacrifice their spare time to company work. That's where I have the advantage."

"Yes, but they're probably getting more out of life than you," said Bill. "You're depriving yourself of a lot of happiness."

"Not at all," said Cary. "I get great satisfaction in designing a machine and knowing it is right. Why should I play bridge, for instance, when I know it wouldn't give me half the pleasure and would probably bore me?"

"Simply to divert your mind into different channels and to cultivate social relationships. If you keep on in the way you're doing, even your engineering will suffer. A change of thought is a great mental stimulus."

Suggested by A. W. Knight, Ipswich, England.

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What Do You Think About This Problem?

Some executives are continually allowing their work to infringe upon their hours at home. Others regard this practice as an evil only to be condoned in unusual instances. Undoubtedly, devotion to one's job is a source of satisfaction and advancement—but how much of it should be carried into the home? Where is the proper balance between a man's vocation and his outside interests? *American Machinist* invites you to discuss this question.

. . . Discussion

of Executive Problems

■

Dole or Control?

Any dole system will lead to graft by both the giver and receiver. There are some people who would get lazy and stay that way under a dole system. We can have prosperity only by full productivity by all parties concerned.

The control of business cycles is a problem which is being attacked by banking institutions all over the country. The Federal Reserve System seems to be accomplishing something, and further work by our bankers will increase its efficiency. To my mind, stock market speculation is one important cause of our periods of business depression. It is not the intention of speculators to depress business, but the result of their alternate enthusiastic boosting and hammering gets away from them, and panic grips everyone.

Another phase of legitimate business endeavor, which may lead to disaster, is over-expansion and over-enthusiastic competition. Every business venture is a gamble, but thorough investigation by investors and honesty of promoters will go far toward assuring success. Poor management and graft in one company would seem insignificant, but they take good money and energy without producing proportionate results. Drastic price cutting by one company can cause plenty of trouble.

—HARRY I. HAZZARD,
International Harvester Company.

How Much Incentive?

Regardless of the saving in overhead which accrues entirely to the company, workmen should hardly feel entitled to the whole saving in time resulting from the wage incentive system. On the other hand, there is no incentive without a substantial money return to the workman. There is a feeling of equal gain, of share and share alike, in the 50-50 plan, the psychological effect of which should not be overlooked in formulating any plan wherein it is economically possible to incorporate it.

I feel that no opportunity should be lost which may be utilized to impress on workmen the well established, but too little believed fact, that their best interests and those of the company are identical. They are indeed partners in the best sense of the word. Every step in this direction leads away from that widely accepted and wholly fallacious doctrine that the men and the company are and must ever be, on opposite sides of every economic question. —JOHN L. PEET.

Can Ideas Be Allocated?

There is one objection to punching a time clock at the beginning and end of each job; that is the general disturbance to the engineer who concentrates on a job at his desk, finishes it, and is ready to start a similar one immediately. In a modification of this system, it was left to the engineers to put the time spent on each job in a note book which served them as a personal record of the work they had done. At the end of the week, time cards were made out by the engineers as a routine job.

This arrangement has one big advantage; times can be adjusted. If a job comes through which takes half a day to work out, and the next week a somewhat similar one comes through which is completed in a half hour, more time can reasonably be charged to the second job. Such elasticity enables time charged to be cut on such jobs where an engineer may have spent twice the time on the job that it really needed.

The above applies to routine engineering work on small orders. With development work and the like, the keeping of time becomes absolutely essential. But I do not think it necessary or desirable to clock between jobs. —S. A. KNIGHT,
Irak Petroleum Company, Ltd.,
Tuz Khurmatu, Irak.

Wholesale or Retail?

The trouble we are facing today in most industrial activities is the high expense in marketing finished products. The elements in production problems are well known, and the cheapening of mechanical operations is pushed to the limit. Why should not the same principle be recognized in distributing the article?

If a retailer cannot interest the buying power in his vicinity, there is either something the matter with his organization or people consider the added expense out of proportion to the service rendered. Anybody will admit that the dealer should have a fair return for his work in distributing goods. But who should pay his wages when he is not distributing anywheres near the amount he could handle?

When some means is found that will utilize the distributing forces effectively, the difference in wholesale and retail prices will be so small that no company will consider it worth while to let their purchasing agent buy goods for their employees. Any industrial plant should go into retail business at wholesale prices on articles the dealer cannot handle economically. The advantages gained in so doing are no loss to the community; but wages should not be lowered because a company helps employees buy at wholesale prices.

—A. E. FRISTEDT, *Bolinder Works,*
Stockholm, Sweden.

Can Engineers Sell?

With the arrival of so many revolutionary improvements in machine design and tooling, the engineer-salesman is slowly but surely displacing the man who, while long on sales psychology, has but a superficial knowledge of things technical. Admitting that the latter type of salesman obtained good results when backed by an effi-

cient engineering department, his technically trained rival does even better, as the following story will illustrate.

A certain concern was in the market for an automatic lathe, with which they hoped to cut costs on a wristpin job. Two salesmen called representing rival firms. The first, after submitting prices and delivery date, was shown the blueprint and asked for a time estimate on the job. After considerable study, he asked for a copy of the blueprint to put before his company's engineering department, promising an estimate within a "day or two." He left, the other salesman was shown in, and after the usual discussion was given the blueprint. After a few minutes study and some calculations with pencil and paper, he submitted an estimate that showed a substantial saving on the method in use, and guaranteed further saving by the use of special tooling. Needless to say, he received the order.

—Robert S. Alexander,
Universal Winding Company.

Concentration or Confabulation?

The tendency of men to congregate and gossip is a form of wasted time which must be watched and kept to a minimum. Since the foremen must keep their men from holding gossipping conventions, they should set a good example by making no social visits during working hours. Of course, all members of the organization should be on fairly friendly terms. The morale of the organization is thereby raised and co-operation is much more spontaneous. The higher executives should not have too intimate relations with their subordinates. If they are too close to the men, their judgment is likely to become impaired, favoritism arise, and the making of the proper decisions hindered. In every instance, business must be first. But a few friendly remarks or a little kidding will relieve the tension brought on by difficult and important problems.

—L. O. Brown, *Toolroom Foreman, Holcomb & Hoke Manufacturing Company.*

Speculating in Personnel

The problem of dealing with key men at a time such as the present, is approached with a lack of frankness by many executives. There is too great a tendency to reduce it to a simple problem of "to go or not to go." I believe it has far more practical personal angles than this simple formula. If the judgment of key men is depended upon to carry the company through periods of prosperity, it certainly ought to be enlisted in times of depression.

Granted that the release of key men should be held off as long as practicable, since their ultimate replacement is mighty expensive, the problem reduces itself to one of expedients to carry over the slack period. One answer might be to hold a confidential session with each such man, offering a week's vacation with full pay, and as many more weeks at half pay as he desires. Almost every such man has cherished an ambition to some time take a long ocean trip, or a visit to some distant relatives, or an idea he wants to develop. Why not make that possible now—at a very distinct saving in overhead, and a wonderful investment in future loyalty? It would seem better to have these men return from such a vacation full of enthusiasm than to merely let them grow stale with days of half activity. When the rush comes, overtime will be given cheerfully and gratis by these men as a token of their appreciation. The vacations, of course, should be staggered.

Another solution might be to explain fully company finances to these men, and ask them to voluntarily accept a temporary cut in salary during this period, with the definite pledge that the deferred salary will be paid them out of profits, if and when profits warrant. Besides alleviating the present situation, such a procedure will do much to stimulate real interest in the future profits of the business, and make these key men real partners.

—Harvey S. Hinchman.

Inspection or Discretion?

The answer to this question should be preceded by a definition of the term "inspector." The chief inspector of a sizable plant is usually a man of discernment, fully capable of deciding minor technicalities of inspection and of realizing when he should go to the engineering division for more information.

It is said that there is a law on the statute books of one of the eastern states requiring that any vehicle proceeding along a public highway under its own power shall be preceded by a man waving a red flag. Presumably every sheriff and district attorney in that state takes an oath to uphold its laws and to prosecute violators. Yet it is safe to say that observance of this law is not insisted upon under even ordinary conditions. Nor will the officials admit they are remiss in their duty.

Judgment should be based upon consideration of all the facts. While the engineering division may be the office most likely in possession of the facts, there are also often conditions apparent to the shop that are not fully realized in the immediate vicinity of drawing boards. Sticklers for exact and blind compliance with drawings cannot logically kick if the shops produce a lot of parts from a drawing in which there is an evident error, but I have never run across one that was not quick to put the blame for a loss on the shop inspectors. I am in favor of delegating a measure of authority to the inspectors.

—Harry Hoisington.

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Will the airplane industry ever be comparable in size and importance to the automobile? If so, how soon?

As a partial yet practical answer to these questions, *American Machinist* next week will present a comprehensive picture of one of the newest and foremost airplane plants in the country—the Glenn L. Martin Company's plant at Middle River, Baltimore, Md.

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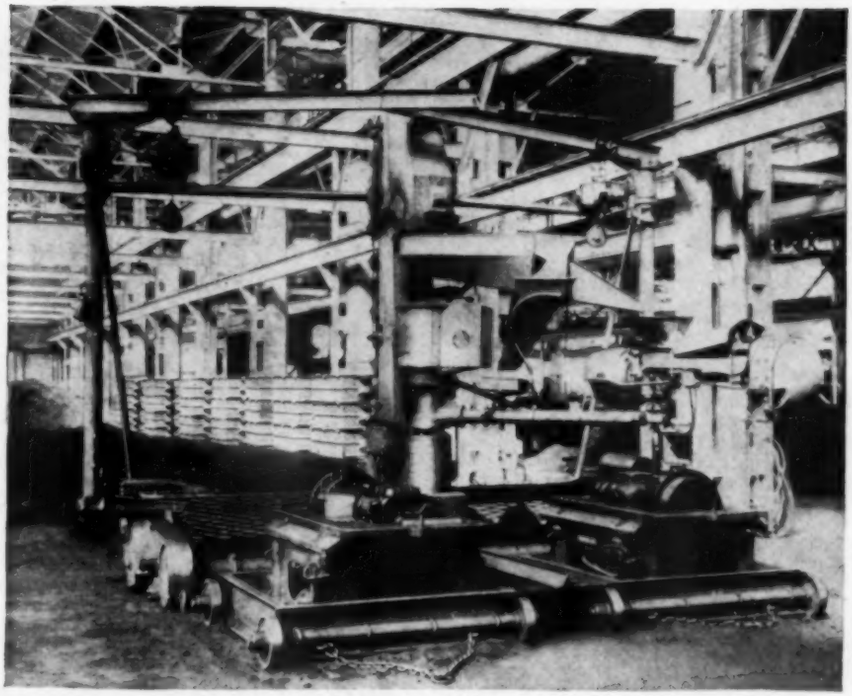
MACHINE-PACED FOUNDING

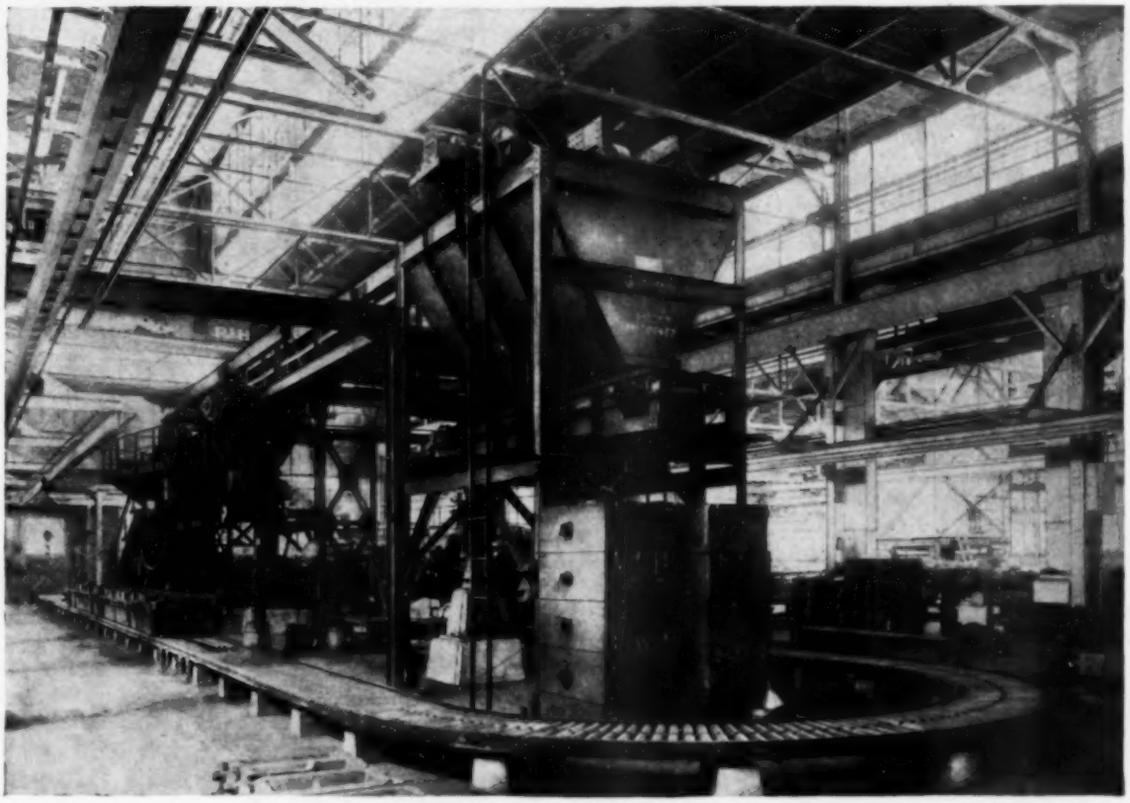
The Caterpillar Tractor Company's Peoria plant provides a fine opportunity to study foundry equipment

Photographs by courtesy of the Austin Company and the Dodge Manufacturing Company

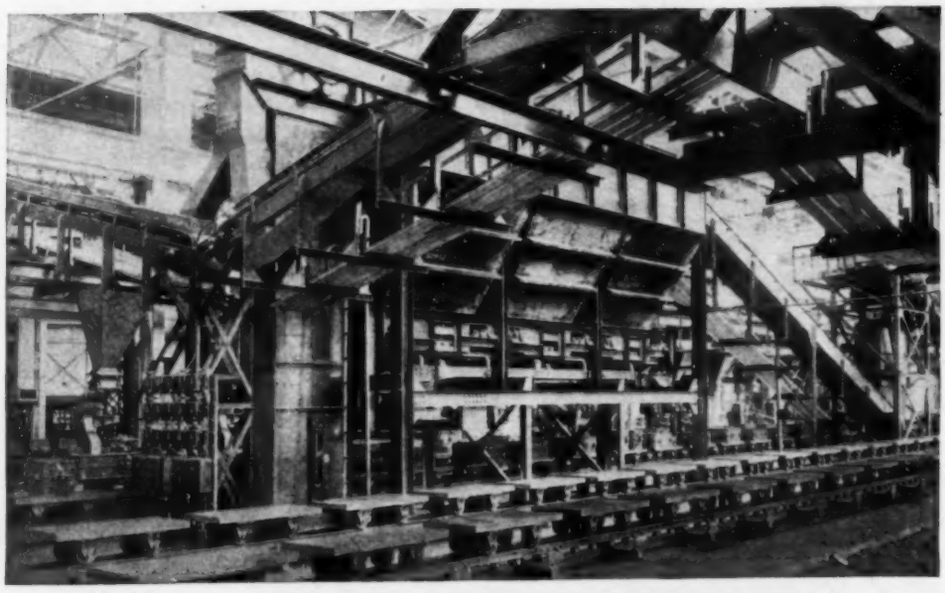


A crawler-type Sandslinger on its way down the floor

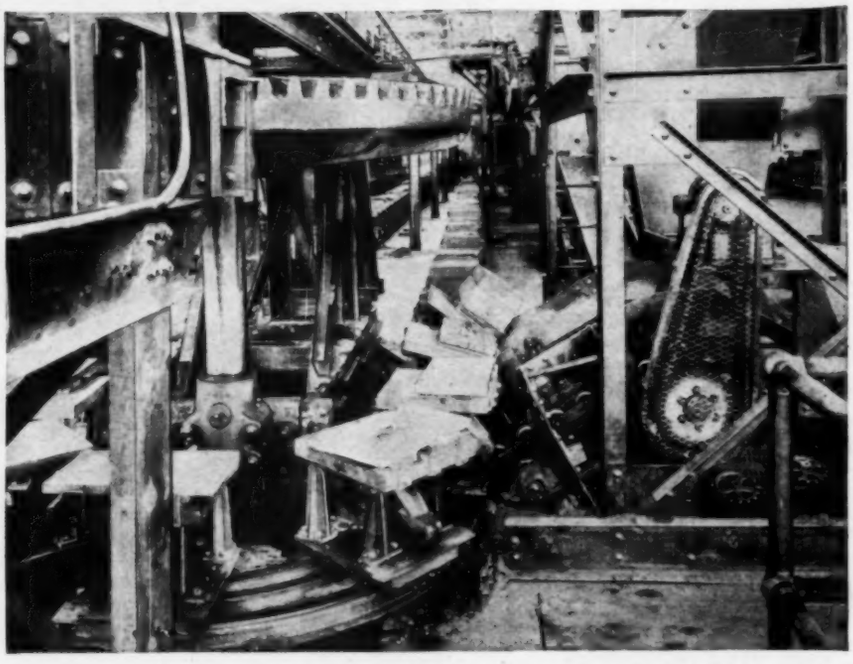
FIVE foundries formerly served the Peoria, Ill., plant of the Caterpillar Tractor Company. One foundry now takes care of all its casting needs, from small gray-iron parts to large transmission cases. This foundry is of steel-frame construction; its side walls are brick, and its roof an inverted monitor. Lighting and ventilation are well developed; floors in the core room are concrete; in the foundry proper, brick; and in the cleaning room, wood block. The entire building can be adequately



In this semi-mechanical unit for medium large castings, reconditioned sand is brought to the molding machines by conveyor



Carrying the idea of mechanization a step further. This continuous-car-type conveyor is fed from a battery of fourteen Milwaukee pneumatic molding machines



The "last word" in mechanization. Mold trays being dumped automatically after being cast. Snap flask molding by machine is practiced on this line

heated in the most severe weather.

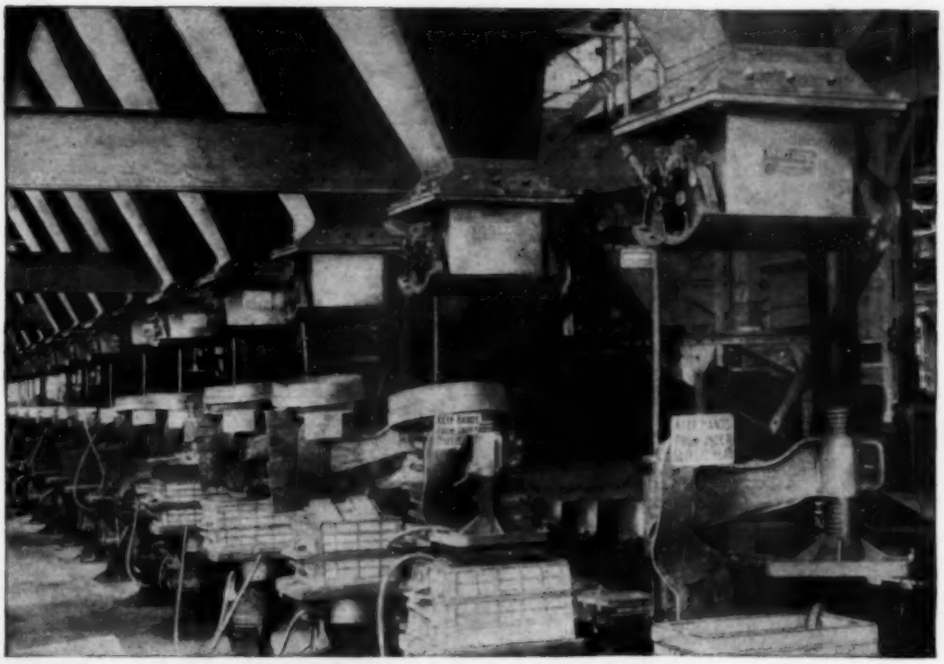
But the equipment in this foundry, more than any other feature about it, deserves attention. This varies all the way from practically complete mechanization for the casting of small parts, to almost no mechanization, except for conveyors, where the larger and heavier pieces are concerned. A foundry such as this, producing a wide variety of shapes, weights, and sizes of castings, has need of varied equipment. It is no surprise, therefore, to find here congregated almost a complete representation of modern types in foundry equipment.

A traveling Sandslinger unit eats into a pile of molding sand and drags behind it two molding tables on which metal patterns are fixed. The sand is hurled into the flask and at the pattern by paddles revolving at high speed, assisted to some extent by the blast of air the paddles create. As fast as the flasks are molded, they are lifted off the metal patterns pneumatically, picked up by the overhead bridge crane, and brought back to the pouring floor. Molding sand is brought down by electric lift trucks provided with dump bodies. While they are on the floor, cores and flasks are assembled by the same crane that handles the pouring ladle.

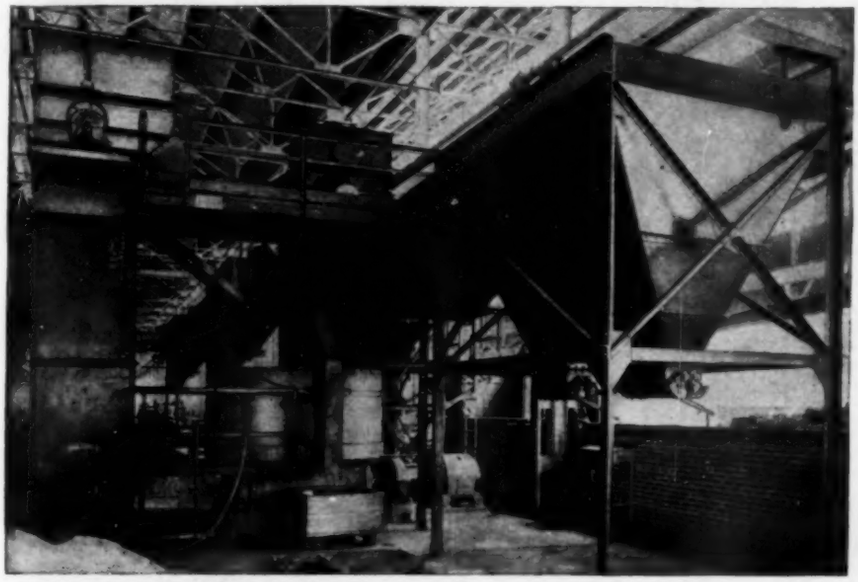
A gravity conveyor unit represents the next step in complete mechanization. Two Sandslingers are mounted on stationary concrete bases, and the sand is brought to them by overhead conveyors. Flasks are handled on and off the molding tables by pneumatic hoists running on an overhead I-beam. Cores are stacked alongside the roller conveyor and are set into place by hand. The cope is assembled to the drag by the same overhead monorail hoist.

Only a small section of the roller conveyor is power driven. Completed molds are pushed by hand around the curved end of the unit to the pouring position where they are picked up by a pneumatic ram mold pusher, located in a central slot between half-width rollers, poured, and shoved to the end of the line. Over this pouring end of the conveyor there is also an I-beam trolley with pneumatic hoist for handling the ladle. Hot metal is brought to this point by the overhead bridge crane that serves the entire bay.

At the end of the line, cast molds are hoisted pneumatically by the trunnions and shaken by a vibrating air tool. Underneath the grate, the hot, spent sand is picked up by a heat-treated belt conveyor which elevates it to a vibrating riddle where the lumps are shaken out. It is then dropped through a revivifier of the squirrel-cage type. On the way up the conveyor, the sand passes under a magnetic pulley which removes any loose metal from the sand. Revivified sand passes along another belt conveyor to one of two 20-ton storage bins serving the Sandslinger units. Below these bins is an apron conveyor which feeds the sand directly to the hopper of the machines. The mold conveyor is only partially power driven, and is not endless, but the process itself is continuous, and there is always a fixed amount of



Battery of squeeze-type Milwaukee pneumatic molders with snap flasks, fed from individual molding sand bins overhead



Independent unit for reclaiming molding sand. It consists of elevator, magnetic pulley belt, revivifier, Simpson mill, and storage bins

sand in circulation among the components of the system.

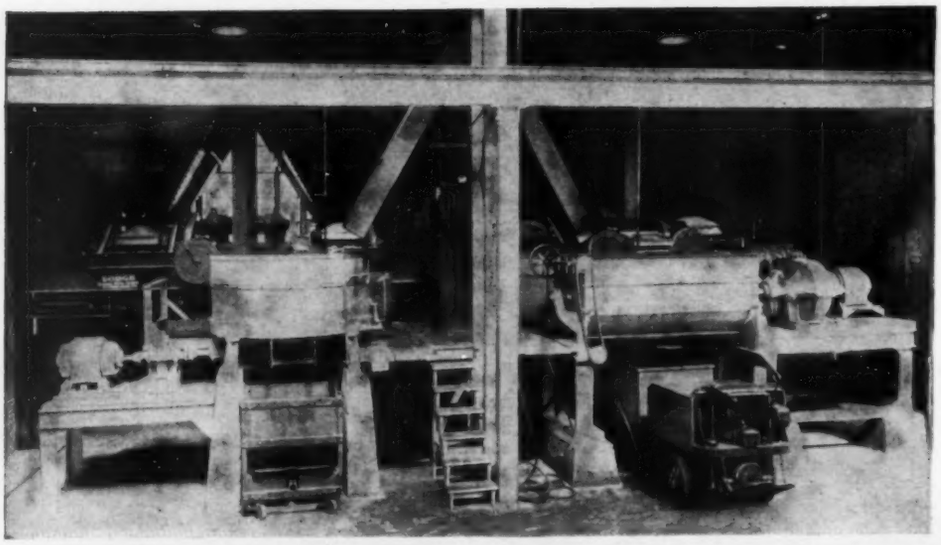
Looking for a further development of mechanization, we come to what is known as a cope-and-drag, continuous-molding unit for medium-size castings. Here, not only the sand-conditioning apparatus, but also the molding unit conveyor is continuous. This conveyor consists of 72 trays measuring 2x4 ft., mounted on 4-wheel buggies on 5-ft. centers. Two such conveyor units are served by a single sand conditioning outfit, similar to the one just described. The speed of the conveyors can be varied from 5 to 20 ft. per minute, giving a maximum capacity of 240 molds per hour each. Because of the smaller size castings, in this instance, fourteen pneumatic Milwaukee molding machines, each with a separate metal pattern, are used in place of the Sandslingers on the other units. Pouring is done by hand from a moving platform at the tail end of the mold conveyor.

Small castings are made in a continuous molding unit that is almost completely mechanical in operation. As in the previous instance, pneumatic molding machines are employed, but, because of their smaller size, there are more of them, 23 in all, and snap flasks are employed. Upon completion of the molding, the molds resting upon their bottom boards are slipped onto the conveyor unit, consisting of 170 16x16-in. sliding trays placed on 27-in. centers. These trays slide on a pair of rails and are carried around by a power chain. The travel of the pouring walk is synchronized with the speed of the mold conveyor, and pouring is done from hand ladles. Sufficient length is provided the pouring zone so that two ladle crews can pour simultaneously.

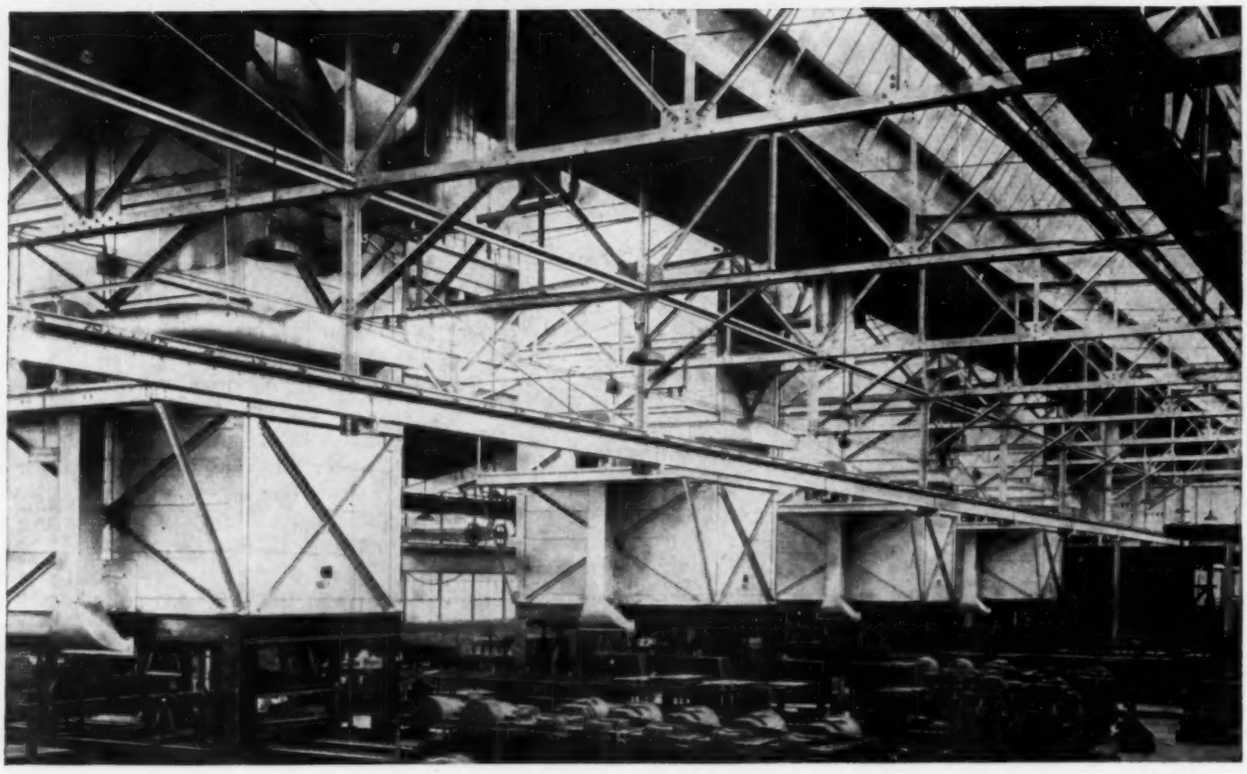
After passing a cooling area about 175 ft. long, the trays are dumped by an automatic trip, leaving the board on the tray and depositing the molds and castings onto a short slat conveyor from which they are dropped onto a vibrating grate set at a 30-deg. angle. Here the sand passes through to a belt and is recovered, while the casting slides off to one side, is picked up by another apron conveyor and dropped into an open-mesh tote box. It is then ready to be picked up by an electric truck and brought to the cleaning department.

As in the other units, the speed of the conveyor can be varied 5 to 20 ft. per min., giving a maximum capacity of 533 molds per hour and necessitating maximum molding sand requirements of 40 tons per hour.

Sand for the crawler-type Sandslinger molder is reconditioned in an independent unit located in an adjacent bay. Spent sand is transported there by electric trucks with dump bodies and is deposited over a bar grating in the floor. Here it is raked through, picked up by a belt conveyor, and carried a short distance to an elevator which discharges it by centrifugal force to another short horizontal conveyor that passes under a magnetic pulley. At the end of this belt, it goes through a Dodge



Metered amounts of two grades of core sand can be fed mechanically into each of these mixers, which discharge into dump bodies on electric trucks



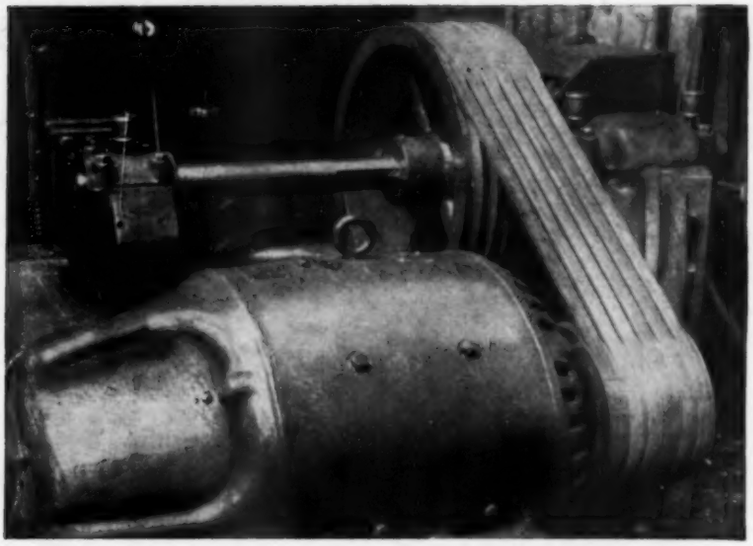
Battery of vertical gas-fired core ovens with mechanical conveyors. The time interval may be varied from 1 to 8 hours, depending upon the core size

single-wheel revivifier of the squirrel-cage type and is finally dropped onto the table of a Simpson mill. From the mill it is discharged to a bucket conveyor. This elevates it to a distributing belt which finally carries it to storage hoppers of 50-ton capacity. There is also a 20-ton bin for facing sand, prepared in thesame mill.

Mechanization has also been carried into the core room. There are two sets of core-sand-preparing machines, both of them served by four 50-ton hoppers, one holding silica sand, one bank sand, and two reclaimed sand. One unit uses a Simpson mill, the other a "Standard" machine. The amount of sand fed from the hoppers is controlled automatically. Under each hopper is an apron conveyor discharging onto a cross-belt conveyor in front, from whence it is brought to a bucket elevator and then, by chutes, to the mixing machines. A dial, placed in front of each conveyor, makes it possible to control the exact amount of sand used. The apron conveyors stop automatically as soon as the required amount has been discharged. Provision is also made for feeding oil in predetermined quantities to the mills. The discharge from the mills goes into dump bodies of electric trucks.

The trucks carry the core sand to the mechanical distributing system. This system consists of a short feeder belt placed directly under a bar-grating hopper, an elevator which discharges onto a cross conveyor, and a 250-ft. distributing conveyor. Along this conveyor are seven single-throw plows with short discharge spouts which deposit the sand on small hoppers resting on the floor near the core-making machines.

Baking of the cores is done in Detroit Sheet Metal Company gas-fired furnaces of the vertical type, 45 ft. high, each carrying 27 swinging trays. The cycle of each furnace may be varied from 1 to 8 hours, depending upon the size of cores being baked.

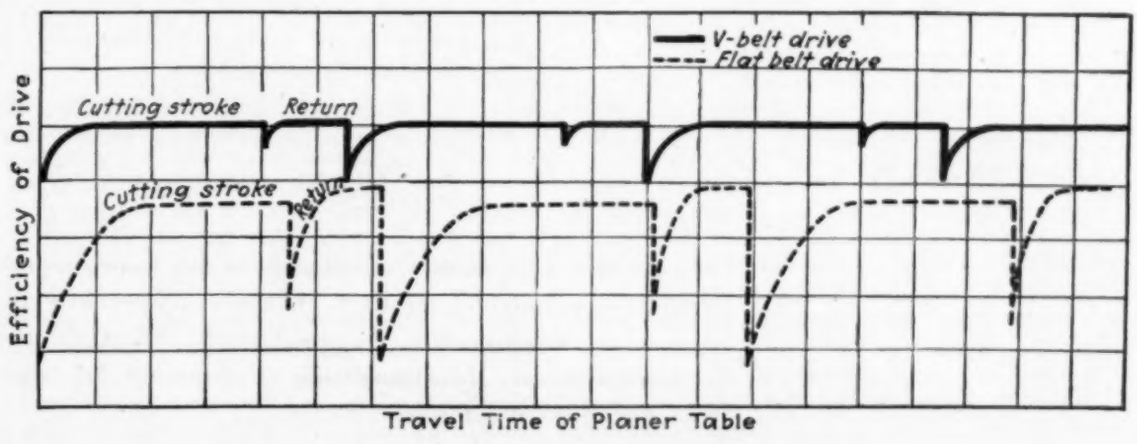


COMPARATIVE DATA ON PLANER DRIVES

A PLANER, unlike any other machine tool, offers a transmission problem that has not yet been fully solved. Because of the reversing action of the planer mechanism, very severe shock loads and intermittent loads are placed on the transmission medium, several types of which are available. In order to compare the performance of a flat belt drive from a uni-directional motor with reversing pulleys, with that of a V-belt drive from a reversing motor, the time of table travel in each direction and reversal were measured. Curves were drawn to show the probable efficiency as represented by the actual speed of travel and by the theoretical, assuming no slip. "Efficiency" is purely graphical in form, has no ordinate scale, but is plotted against the travel time of the planer.

The flat belt drive curve shows a low efficiency at the start of the cutting stroke owing to the fact that full load is placed upon the drive when the table has reversed its action at this point. Although the flat belt does not reverse in the direction of its rotation or operation, the belt must be shifted over a series of pulleys working in conjunction with the gear mechanism for this purpose. The greatest amount of slip occurs at this point, resulting in low efficiency of operation. The efficiency increases until it reaches its maximum, and the belt continues to operate at this efficiency until the cutting stroke of the planer has been completed. At this point the belt is again shifted for the return of the table. Since very little load is placed upon the drive on this return stroke, the efficiency naturally increases.

With the V-Belt drive, greater efficiency is obtained at the start of the cutting stroke where the drive is subjected to a heavy load, and the only loss in power is the result of a slight amount of creep. A dip is shown in the curve to indicate acceleration of the motor. Until the reverse action of the belt is required, the V-Belt drive continues with a steady and efficient performance. At this point a slight increase in efficiency results, but the maximum is soon reached as can be seen on the accompanying graph. The loss in time in completing the cycle of operation is a function of the positiveness of the drive. Because the flat belt is less positive, it requires actually 10 per cent greater amount of time to complete the stroke. In other words, the V-belt-driven planer makes ten cutting strokes during the time that the flat belt drive made nine. At the same time the power consumed is greater for the longer period of time for the flat belt on account of less efficient operation.



The Foreman's Round Table

SAUCE FOR THE GOOSE

"HOW about a few eats?" hailed Ed as he entered Al's office. "Some way, I always feel hungrier on Monday than any other day. Hurry, while I'm still able to walk."

"All right, let's go. What do you know that's new?"

"I got a letter from that assistant superintendent I met on my vacation, and he says their general manager is still violating the sanctity of caste down there."

"What has he done now?"

"Well, this man says that he has functionalized the whole organization. You remember that industrial engineers used to have a lot of fun functionalizing the foremen, when they couldn't think of any thing else, but this guy has functionalized the whole works."

"Just what does that mean, Ed?"

"Well, according to what this man wrote, the engineering department confines itself entirely to engineering, laboratory, and experimental work. When they send the drawings into the shop they are done."

"My, my, that puts their reputation at the mercy of the shop doesn't it? Who is the inspection department under?"

"Under the shop. The general manager said the old idea that the shop has to be watched and checked by half a dozen different executive departments is out of date, and that a shop executive is just as jealous of his reputation for mechanical quality as the chief engineer is for design quality. But that isn't the worst. The purchasing department runs the raw material store rooms, and in effect sells inspected and tested material to the shop. No one but the purchasing agent has to worry about material. He must have it in stores ready to issue."

"Another blow at old man Alibi. He can't say that someone did not order it on time, or that he expects it tomorrow, can he?"

"Nope, and the old man made it very clear that he expected the material to be in stores when wanted, not because of a larger stock of material, but because the purchasing agent's interest did not end with ordering."

"Good for him."

"Wait, though, till you hear this. I kept the best until last. He told the head of the production department that in the future his department would be part of the shop organization. The production manager, I think they call him, almost collapsed. The old man told him that the work done by the production department in keeping track of production did not require any greater effort or intelligence than it did to get out the material the production department kept track of. Isn't that telling them something?"

"I never could see, Ed, why a clerical department of three or four men should rate a manager, and a shop department of a hundred men have only a foreman."

"The letter said that the old man told the production head he expected him to take over enough shop activities to justify his title, and that his first duty would be to do the planning, not for, but in conjunction with, the shop organization, and to have finished parts ready when wanted. To fix that responsibility, he gave the production department charge of finish part stores, just as the purchasing department had rough stores. He told him the same thing about having parts in stock when wanted."

"A toy for each to soften the blow, eh? Or is it really extending their control over the shop?"

Would the organization mentioned be an improvement over present methods or not? Is the way to secure efficiency to functionalize responsibility? What is the difference beween functionalizing departments and functionalizing the plant as a whole?

▸ ▸ ▸ Discussion of Former Topics

The Worm Turns

Since 1915 management has been on a protracted spree in various forms of so-called welfare work. Corporation by corporation, it has finally seen the error of its way, and the present swing is toward a more sane application of fundamental economic principles of welfare. During the present year practically the only companies or corporations overplaying their hands on welfare work are those who, even during a depression, show black either from the nature of their business or because they have an income from other sources or investments. These few corporations will continue their welfare policy until, by competition or major changes to their disadvantage within their respective industries, their surplus begins to shrink. When the pocket book loses its plumpness, welfare work is one of the first over-expanded luxuries to be pruned.

Having had part in determining and developing the welfare work in six or seven corporations and having seen the reaction of the employees, I invariably meet one sentence which greatly handicaps management's welfare efforts. That is: "How much does this welfare work cost and who pays for it"?

Money spent on welfare can be used to far better advantage if it finally finds its way into the workers' pay envelopes. Whether this is through direct pay raises, earned by improving quality, through production increase bonus, or any other wage incentive plan, is immaterial. It invariably means greater income for the company without increasing its net expenses in dollars.

—E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan, Inc.*

From Another Angle

I think the fault with respect to drawing interpretation lies neither with the draftsman nor foreman, but rather with the management, which to my mind is the real place for the application of further education.

While some drawings are occasionally made as a record of something already built, their real function and major use is to create a new design. Now, a new design represents a new idea, the ultimate expression of which is an experimental machine. To the draftsman or designer, the important considerations are basic principles, functioning, clearance, etc.—something that will do something. That's what his mind is on—fundamental design detail. The way in which he uses dimensions in his calculations is radically different from the way the shop can best utilize them. Since the machine is frankly an experimental risk, management has a natural desire to keep costs down. There's no use in elaborately detailing drawings and doubling drafting costs when the fundamental consideration is whether the resultant product will be a commercially successful machine.

In building that experimental first unit, engineering maintains close contact with the shop, and the shop in turn puts some of its very best mechanics on the job. They work closely together, make modifications on the job as they go along, and the machine suddenly is a commercial success. Then management makes its greatest mistake—it immediately orders the machine into production.

Well, why not? Because the drawings that were good enough for expert mechanics and designers working closely together on an experimental unit are not fit for production. These development drawings are no more suited for production than a hand hack saw is. But management sees a successful product, made from drawings, and unthinkingly assumes they can be reproduced in quantity. Actually, though the delay may be irksome, and the cost staggering, these drawings should be redrawn as production drawings, using "shop wise" dimensions and details, rather than design ones. If it's not done, the resultant difficulties are neither the fault of the drafting room nor shop, they should be placed squarely at management's door.

As to details, I don't believe a two-color print paper feasible. Carefully controlled, weighted lines on production drawings accomplish the same result; heavy lines for actual outline, light lines for dimensions, dash and dot lines for centerlines, etc. Tolerances can be simplified by a printed note on all drawing forms "Dimensions in inches. Tolerances —— except as noted," with the blank filled in, and immediately 90 per cent of the tolerances disappear from the face of the drawing for that's the minimum that will follow a general tolerance on the average drawing. After all, it isn't a question of cheapening drawings or increasing their cost, but rather one of recognizing that there are distinct types of drawings, each one economically best for its particular purpose, subject to change when that purpose changes.

—FRED SCHIMPT, *Supervising Draftsman, Naval Aircraft Factory.*

The Community Fund

There is no question that an emergency now exists because of the many persons out of work. A lot of these folks were self-supporting in the past, but this year will need some help to tide them through the winter. The savings of last year have been used, and now the community fund will have to be drawn on. So, I am in favor of expecting every person, both man and woman, who is working even part time, to contribute something to the community fund for the relief this winter of those out of work, sick, etc. The need is greater than we realize, and every one should be glad to give. Management should also pass the word around through meetings with the employees and by other means, that the company is supporting the community fund and that they expect everyone to give, unless he has good reasons for not doing so. The foreman especially should back this movement. He knows what each man has been earning, how steady the work has been, and if the man owns his own home, auto, etc. In some factories the foreman

himself calls a meeting of all the men in his department and gives a short talk on why the men should support the community fund and what it means to him and the company to have the fund well subscribed in the shop.

Last fall the Dayton, Ohio, Foreman's Club worked on the industrial solicitation and collected $158,000 from the shops. This year the club will have entire charge of the industrial group and expects to collect a larger amount. The foreman's club is composed of about 900 foremen and other executives and has the support and confidence of both management and men.

—E. H. TINGLEY, *Secretary, National Association of Foremen.*

Stealing T. C. Tools

The increasing loss through theft of tungsten-carbide tools may be largely prevented by the following method.

Near the back end of the tool, mill a slot 1 in. long and about $\frac{1}{16}$ in. deep, and in the slot stamp the company's name, or perhaps, "Stolen from —— company." Different size tool bits can be milled and stamped in proportion to their size. This milling and stamping would only be a matter of a few minutes work and would not materially weaken the tool. The lettering, of course, must be very carefully done, otherwise the shock may injure the bit. It would be necessary to mutilate the tool noticeably to obliterate the stamped letters.

While this method may not be a cure-all, I believe it would have a discouraging effect on the theft of these tools. —LOUIS JOHN LUBIN.

Under Cover

What is so distasteful about having an under-cover man in a manufacturing plant? There is no reason at all for fear if a person has done the right thing. Of course, if a man is in on the shady affairs in a plant I can see where the objection comes in. I think it a very good way to get information about conditions in the plant. I can see nothing humiliating about being an under-cover man.

The success of an under-cover man depends upon the man to whom he reports. If the employer analyzes the reports carefully and takes steps to "sew" things up a little tighter, the organization will profit. On the other hand, if he gives orders to have so and so "fired," the first thing he knows, the employees become alarmed and suspicious. Nevertheless, the only way to correct trouble is to investigate. —MAURICE H. BAITLER, *Perkins Machine & Gear Company.*

The Safety Court

If a court is set up for the purpose of trying men who have met with an accident, which may or may not be due to carelessness, the executive is providing an excellent excuse for the men in question to withhold the report of trivial accidents.

An unbiased report of all accidents is to be desired for obvious reasons. One method would be to appoint a responsible person to investigate the reason in each case, and if, in his opinion, either the man, his foreman, or the system is at fault, he should make out his report accordingly and arrange for the matter to be dealt with by whatever means are available. Supposing a man with, say 75 points against him, cuts his finger on a tool point. He could hardly be expected to risk a further fine by reporting it. As a result of concealing the injury the cut becomes septic. This, in my estimation, is sufficient reason for turning down the court idea. —HAROLD THOMAS, *Birmingham, England.*

Playing Favorites

It is good management policy to rotate the "dirty" jobs, but a man may eliminate himself from the good jobs by his "sloppy" workmanship. He should be penalized and told why he doesn't get his share of good jobs. Regardless of personality, appearance, or disposition, the only yardstick a foreman should use in appraising a man is his workmanship.

To match tempers with a man is confessing a weakness. After all, the ability to check the temper is one of the qualifications of leadership, and the foreman should be expected to exhibit that qualification. Getting the most out of every man, regardless of individuality, is the foreman's job. —DONALD R. WATSON.

Trade Secrets

Here's how our company gets around it: Whenever a man of ability is hired, such as a foreman or designer, he must sign, among other things, a paper which states that any invention of the employee made while on the company's payroll, pertaining to the factory's product, becomes the property of the company.

In other words they are advised right at the start how they stand, and accept their positions accordingly.

—H. FORSCHNER.

Keep Out

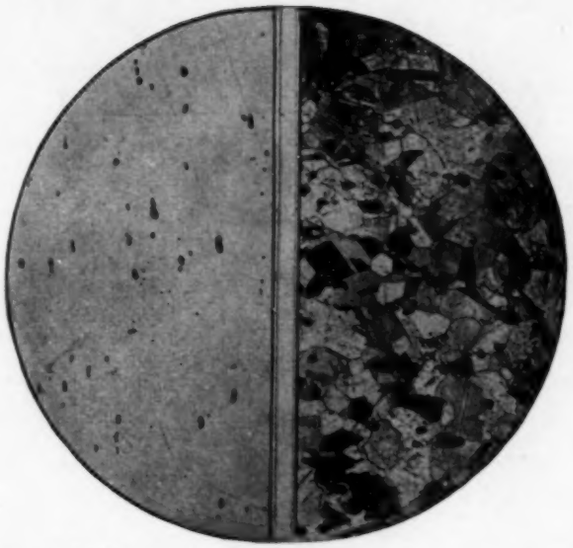
The absence of an executive on vacation is very often taken as an opportunity for making changes which he might be averse to if the matter were left until his return.

If the sequence of operations laid out by the superintendent did not meet with the approval of the production man, it would have been better to have adhered to them for the time being, unless this meant adding to the cost of manufacture or the possibility of producing an unsatisfactory job. To bring in the vice-president has the appearance of trying to take a rise out of the superintendent.

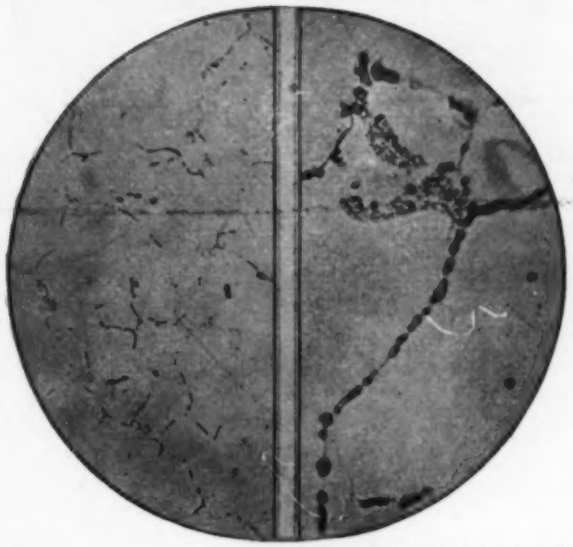
The matter could be referred to the superintendent on his return, and any alteration necessary could then be made with his approval and on his responsibility. It was certainly tactless of the superintendent on his return to proceed immediately to enforce his views. If he had sufficient confidence in his own abilities and judgment he should have allowed matters to take their course for a time and watch for an opportunity to make good his case against the production man.

—W. L. WATERHOUSE, *Staffs, England.*

GAS-WELDING COPPER



Macro- and micro-sections showing oxide specks scattered through ordinary copper sheet



Macro- and micro-sections showing separation of oxide to grain boundaries adjacent to weld

High-strength oxy-acetylene-welded joints require suitable materials and correct technique

WELDERS who have had occasion to weld copper know that joints often show disappointingly low strengths. This has undoubtedly tended to restrict the application of the metal, for there are many places where copper would be used if tight, high-strength joints could be produced.

For a long time, it was thought that weakness occurred in the weld metal itself, and numerous attempts were made to improve weld quality. In spite of these efforts, welds continued to break. It was noticed, however, that with improved quality of weld metal, breaks occurred outside the weld and parallel with it. Tensile test specimens were found to break at practically the same load per sq.in. of base metal, regardless of welding rod composition, an indication that the trouble lay in the base metal. Microscopic examination proved this line of reasoning correct; it showed that the trouble was caused by the oxide present in ordinary commercial copper.

In order to understand why oxide should be present, refining and casting practice must be reviewed. The electrolytic refining process yields copper of extreme purity, total impurities amounting to only 0.01 per cent. But this copper must be melted and cast into ingot form for use, and molten copper has the unfortunate property of absorbing gases. Absorbed oxygen forms cuprous oxide which dissolves in the molten copper, causing its purity to drop to 99.7 per cent or lower. Before casting, most of the oxide is removed by poling, but it is not customary to remove all of it. The 0.01 to 0.8 per cent of oxygen in the form of cuprous oxide contained in the bars as they are sent to the rolling mill will cause difficulties.

Microscopic studies have shown that when cast copper cools, the cuprous oxide present separates out along the grain boundaries. Each tiny grain of copper has specks of oxide at its boundaries, the brittle oxide tending to cause breakage along these lines. The rolling operation breaks up the original grains, however, forming a new grain structure which has oxide specks scattered throughout its structure, usually where they do not influence fracture. Well-made copper sheets are thus strong, tough, and ductile.

The heat of welding is sufficient to cause the oxide specks to collect along the grain boundaries of the base metal adjacent to the weld. This causes the zone of weakness in the base metal as shown in the accompanying photomicrographs. Since oxide is the cause of the trouble, copper without oxide would give best results. Numerous tests have proved this statement correct; high-strength welds are easily made with completely deoxidized metal and rod. Deoxidized copper sheet, produced by adding silicon to the molten copper just before casting, can now be obtained commercially. It should be specified as "copper completely deoxidized with silicon," and should contain from 0.05 to 0.15 silicon to allow for loss of this element during welding. A similar copper welding rod is available. Average results of a number of weld tensile tests are given in Table I. The apparent gain in strength and ductility can be further increased by hammering and heat-treatment.

At a temperature above red heat, ordinary copper plate

Photographs through the courtesy of the Linde Air Products Company.

Above — Completely deoxidized copper sheet shows no oxide specks

Above — After welding deoxidized sheet with deoxidized rod, no oxide separation is evident

Oxide crystals in welded commercial copper fall out after slight bending

containing a small percentage of cuprous oxide is quite brittle. This brittleness is at a maximum just below the melting point, at which temperature the copper has practically no strength. Consequently, to test the weldability of copper, heat a piece bright red and hammer it vigorously on an anvil. If it breaks, it contains too much oxide for satisfactory welding.

Where deoxidized copper and welding rods are used, welding technique is quite similar to that employed in welding steel. Because of the high heat conductivity of copper, the tip, or welding head, should be one or two sizes larger than that used for steel of the same thickness. Covering the work with asbestos paper will also help to prevent loss of heat. Large sections should always be preheated to a dull red, and small parts treated likewise where possible. No flux of any sort is needed. Copper melts at a relatively low temperature and flows more readily than steel. The welder will notice these minor variations quickly and modify his manipulations accordingly.

Table I—Tests of Welds in Copper

Material	Ultimate Strength, Lb. per Sq.In.	Elongation in 2 in., Per Cent	Remarks
Welds in ordinary copper plate containing 0.01 to 0.08 per cent oxygen.	15,520	8	Break a small fraction of an inch from the weld.
Welds in deoxidized copper plate	26,250	23	Break in weld.
Original deoxidized copper plate	32,000	45	.....

For any considerable copper work, such as repairs on existing equipment or the use of stock sheets, metal deoxidized with silicon is not available. Many coppersmiths, maintenance men, and steamfitters—especially those engaged in marine work—have found that a joint tight and strong enough for most purposes can be made in ordinary stock copper with bronze welding rod. Technique for bronze-welding copper pipes, castings, and sheet is almost the same as for bronze-welding steel or cast iron. A neutral flame of minimum size is used. Parts to be joined are put in contact and heated to a temperature which will show red in daylight, or just to the point where bronze will unite with the base metal, and a "tinning" layer of bronze is flowed on. Brazing flux is used freely in applying this first layer. Bronze is then built up on this base to the proper thickness and width for the required joint. This work can progress along a seam in sections, "tinning" and building up being done in 2-in. stretches. Chemical plant equipment, such as coils, are fabricated by bronze welding, as are also certain parts in motor construction.

On copper castings, and on sheet over $\frac{1}{8}$ in. thick, the edges are beveled. Considerable care must be used to see that the "tinning" coat is thoroughly applied, work being completed as rapidly as possible with a minimum of heat. The welder should be particularly careful to keep the heat as localized as possible. Some welders build up ridges of asbestos cement along the seam to provide for this last factor.

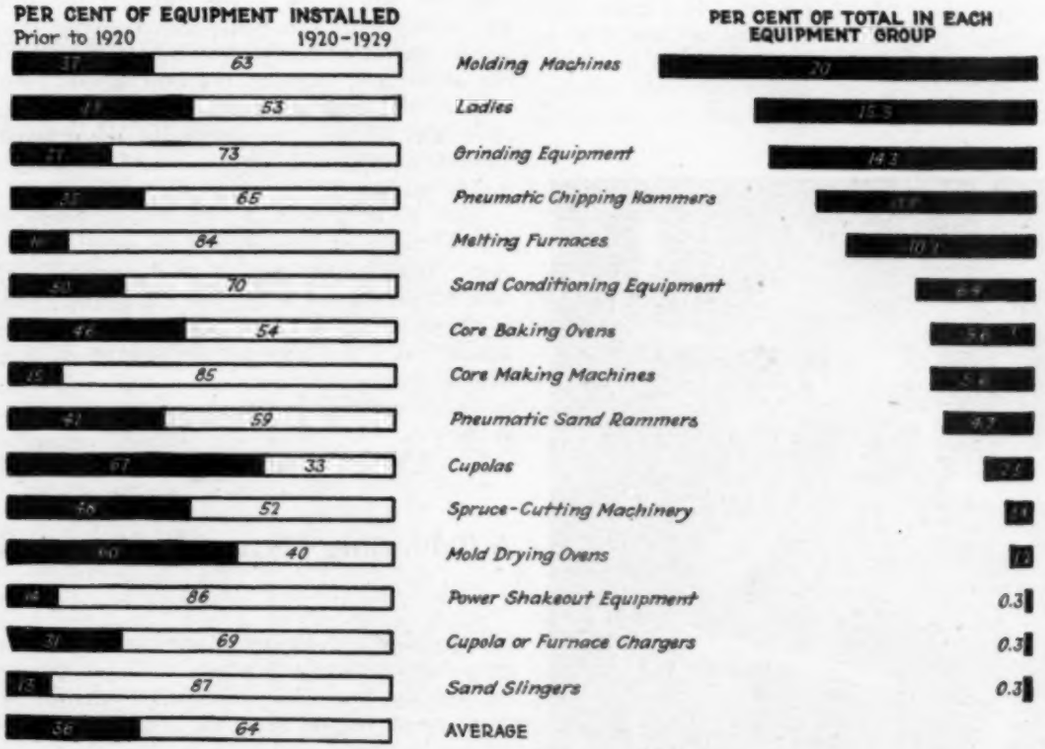
AMERICAN MACHINIST 1930 INVENTORY

of Metal-Working Equipment

Report No. 15—Foundry Equipment in Industrial Plants

REPORT No. 6 of this series showed the status of furnace equipment in industrial plants; report No. 10 gave similar information for plating, lacquering, and other finishing equipment. In both these reports, it was pointed out that the presentation of these data represented an extension of the scope of *American Machinist's* inventory, since neither of these equipment groups was compiled in 1925.

The following figures, which form a third report in this classification, show 36 per cent of foundry equipment to be over ten years of age. This compares with a 44 per cent general average of all industries indicated by the inventory made five years ago. Since foundry equipment was not included at that time this comparison is not of great significance. However, it is interesting to note a similarity in the percentages obtained for the three auxiliary equipment groups reported thus far. 32 per cent of the furnace equipment and 33 per cent of the plating equipment are over ten years of age. This latter figure does not include finishing equipment, only 16 per cent of which was this old. The inference is that machine tools proper are run longer than other plant apparatus. Foundry equipment shows a wide age variation for the various subdivisions, ranging from sand slingers with only 13 per cent over ten years old to cupolas with a corresponding figure of 67 per cent. For cupolas, cumulative repairs are often equivalent to replacement, so this percentage must be considered in the light of foundry practice.



IDEAS FROM PRACTICAL MEN

Graduating Machine for Special Rules and Gages

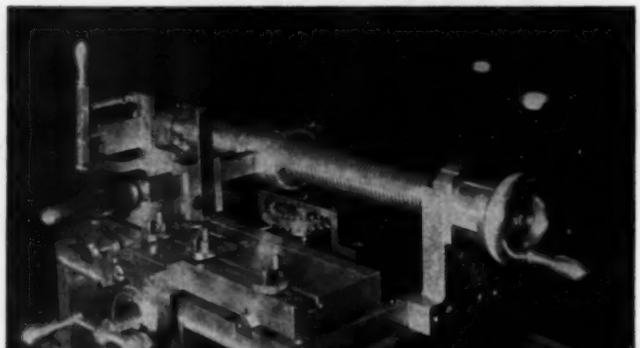
R. B. LOVELAND

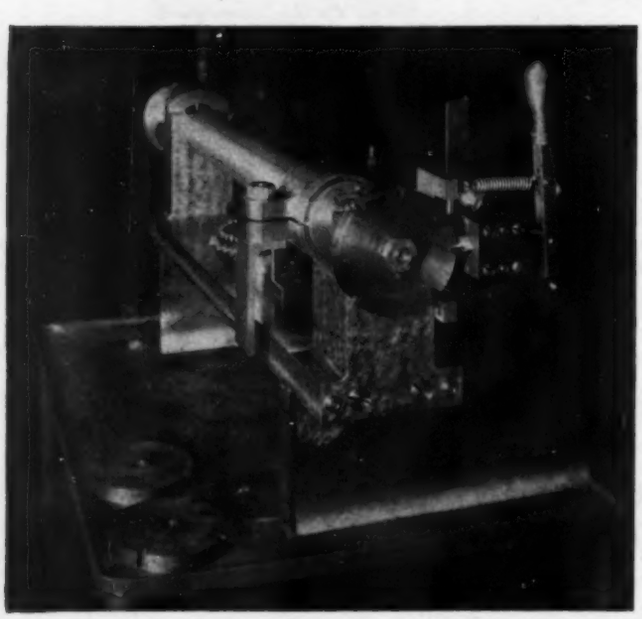
A METHOD for graduating gages and other tools required in the several departments in the shop brought about no little study on the part of the management. After careful consideration of the subject, the hand-operated graduating machine shown in the illustrations was developed.

The lead screw is 2 in. in diameter and has four Acme threads per in. It is carried in two hardened and ground tool-steel, split bushings. The right-hand bearing has a ball thrust on each side. The handwheel carries a micrometer collar graduated to read to 0.001 in. Outside of the left-hand bearing is the dividing disk, of which there are three; one with two notches for $\frac{1}{8}$-in. graduations; one with four notches for $\frac{1}{16}$-in. graduations; and one with eight notches for $\frac{1}{32}$-in. graduations. The disks are made of tool steel, hardened and ground, and are $\frac{1}{2}$ in. thick and 4 in. in diameter. The notches are $\frac{5}{16}$ in. wide and have an included angle of 14 degrees.

The index latch is of tool steel, hardened and ground, and is $\frac{5}{16}$ in. square in the bearing, in which it is held cornerwise to enable ease of adjustment for wear. A coil spring holds the latch in the disk notches, from which it can be withdrawn by a lever. The lever that carries the lead nuts and the graduating tool has a collar that is sawed through at the back, so as to clamp the lead nuts, there being two nuts to provide adjustment for wear. On the lever is the toolhead, having a knurled-head screw to clamp it in position. On the right-hand side of the toolhead is a slot to receive the high-speed graduating tool, which is ground to a sharp V-point and is held in the head by a hardened tool-steel bolt having a tapered head flattened on one side. A slot is cut in the bottom of the toolhead to receive a roller, which rests on the work. The depth of the graduations is controlled by the setting of the tool below the roller.

The table is supported on two tool-steel ways that are





hardened and ground, and are lapped into the V's of the table. On the top of the table is a raised strip to align the work. A T-slot, running the full length of the table, holds the bolts for clamping the work. A screw, operated by a ball crank, moves the table in or out at a right angle to the lead screw. An automatic stop at the rear controls the inward position of the table, and so limits the lengths of the graduations. The automatic stop is geared to the lead screw so that it makes one revolution to each inch of toolhead travel.

Since $\frac{1}{32}$ in. is the finest graduation provided for, there are 32 pegs of hardened tool steel in the automatic stop. Each of the pegs is of the proper length to take care of the varied length of the graduations. All that is necessary is to index the screw and move the table inward until the stop pin at its back contacts with one of the pegs in the automatic stop, and then move the table out against the front stop, bringing the work clear of the tool.

A Babbitting Fixture for Crosshead Shoes

P. H. WHITE

The babbitting fixture illustrated was devised for use on a construction job where facilities for repairs were not readily available, and crude measures were sometimes employed to keep the equipment running. The driving engines for a stone crusher plant were subjected

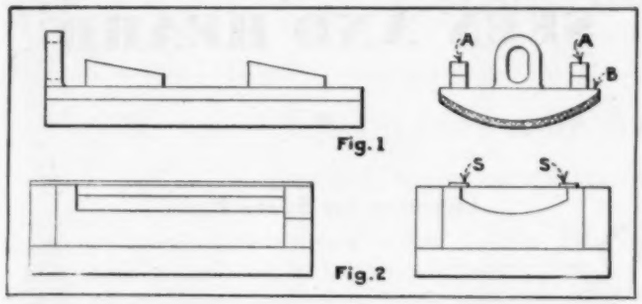


Fig. 1

Fig. 2

to the grit from the crushed material which made frequent repairs necessary. A pair of 125 hp. simple Corliss engines furnished the power, and extra repair parts were kept ready for use.

The form of crosshead shoe is shown in Fig. 1. The body is of cast iron, with a babbitted wearing surface which comes in contact with the guides. The babbitting fixture is shown in Fig. 2. It consists of a wooden box with two iron strips fastened to the top. The inside dimensions of the box are somewhat greater than the over-all dimensions of the shoe. The two iron strips *S* are spaced so that the two lugs *A* on the shoe will just pass between them, and the surface *B* will rest against the under side of the strips. With a finished shoe in this position, the box is filled with a grouting of neat cement, and allowed to set. After the cement has sufficiently hardened, the shoe is removed, and the surface of the mold is given a coat of graphite paint.

It is necessary, of course, to use clay or some other form of lute to prevent leakage while pouring. The only finish required is to trim off the fins and chip the oil grooves.

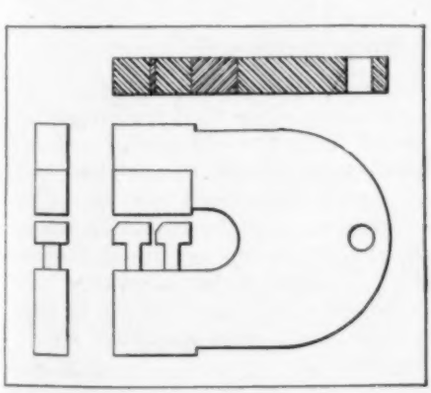
■

An Improved Limit Gage

A. Meola

Chief Inspector,
Monroe Calculating Machine Company, Incorporated

In the illustration is shown what we think is an improved limit gage of the snap type. While the gage is apparently of the conventional design, the adjustable Go and Not Go anvils are rectangular instead of round, their sides being parallel to and in line with the sides of the fixed anvil. Also, the gap between the adjustable anvils has been greatly reduced by bringing their heads within approximately 0.010 in. of each other. The purpose of this gage is to overcome the difficulty encountered in gaging small diameters close to shoulders.



The short gap between the go and the not-go anvils prevents the work from coming out of location, and the parallel and in line condition of the sides of the anvils facilitates and insures accurate measurements close to shoulders.

Gages of this type have been in use for some time, and investigations have shown that both the uniformity and the quality of parts inspected are greatly increased by their use. Indeed, the chances of defective work passing this type of gage are practically negligible, as compared with gages of the conventional type. However, the main advantage is that uniformity of product is insured, and that the operator who is doing the work can gage the parts with ease.

The short gap between the adjustable anvils, and their beveled edges, reduce the possibility of nicking ground— or highly-finished work in passing from one to the other. In addition, there is greater wearing surface at the point where the gage does the most work, thereby increasing the life of the gage.

■

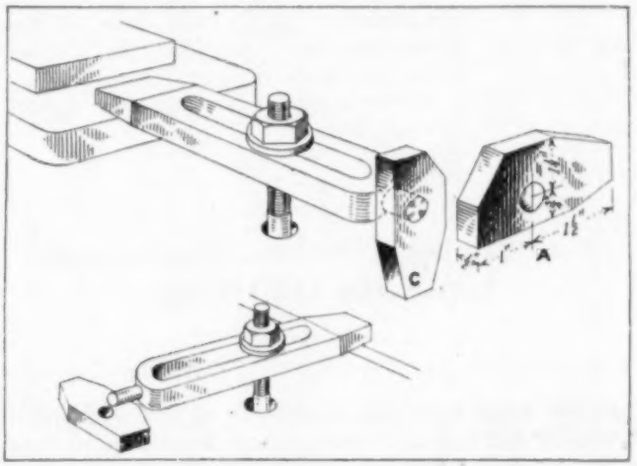
An Adjustable Clamp-Block

Charles H. Willey

Superintendent of Manufacturing, Hoyt Electrical Works

A bearing block that will permit the tail of a strap clamp to be set at five different heights is shown at *A* in the illustration. Such a block will be found very useful, particularly in clamping dies of various thicknesses to the bolster of a press, as it can be quickly set.

The lowest position of the tail of the clamp is when



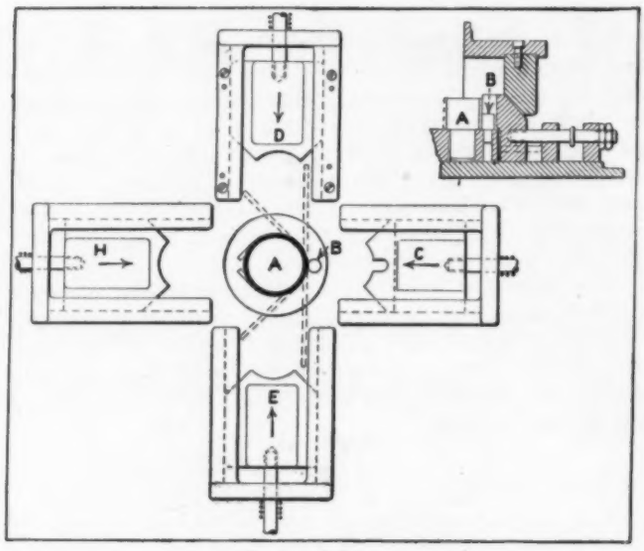
the block is laid flat, as at *B*. By placing the pin on the tail of the clamp in the hole in the block, the block can be placed on any of its four edges, giving center heights to the tail of the clamp of ¾, 1, 1¼, and 1½ in., respectively, as indicated by the dimensions. At *C* the block is set to give the highest position to the clamp tail.

■

Tools for Making Sheet-Metal Sleeves

John M. Krohn

We are producing sleeves of sheet metal in one operation, after blanking, in the press tools shown in the illustration. The blank is placed between the pin *A*, around which it is bent, and the guide pin *B*, being cen-



trally located by a stop, not shown. Four sliding members carrying bending blocks are moved toward the center by cams, or wedges, held in the punch holder. The cams are so set that the dies engage the blank consecutively, finishing the piece when the bottom of the stroke is reached.

The blank is indicated in its various stages of bending by dotted lines, the completed sleeve being shown in black. These stages follow one another so quickly that no attempt has been made to show the positions of the sliding members at each stage. In the upper right-hand corner is a section showing the inclined faces of the cams and the sliding members, indicating the method of operation. It also shows the spring arrangement by which the sliding members are returned to their normal positions as the ram ascends.

■

A Fractional, Number, Metric, and Letter Size Drill Table

LARS S. CURRY

Chief Draftsman, The Wheeler-Schebler Carburetor Company

In the usual handbook, each type of drill is charted separately and it is necessary to turn from page to page to select a drill a few thousandths larger or smaller than a given size. Consequently, we have made up the table reproduced on the following page for use in our engineering, experimental, drafting, and tool departments.

In making liquid precision metering instruments, carburetors, and Diesel fuel injector systems, which deal in areas to very close limits, it is necessary to have a drill of exact area in order to get a hole of the required area. Also, in drilling bearing holes, a close joint must be made between shaft and bearing so that the accuracy of the instrument is not impaired. We also use standard drills for go and not go gages on occasion, thus saving the cost of the gages, which may be used but once. Sometimes also, holes are to be drilled to take a part. Since standard parts can be bought for much less, it is often advisable to drill the hole to the standard size. Often, however, the drill size required is too short, and a close size which comes longer must be substituted. These are but examples of the use of the chart.

SEEN AND HEARD

●

Charging for Spare Parts

ONE shop I visited recently had solved the spare part problem satisfactorily, for them at least. They supply standard parts of current machines at a fair profit on the cost of production. As models are discontinued the part price increases to cover the cost of storage and capital invested. On very old machines, parts are charged on the basis of making them up specially for the customer, which has to be done in many cases.

If the customer understands this method he ought to see its fairness and expect to pay more for old parts.

Cold Working of Metals

IN THE old days of hand forging we laid great stress on the improved quality of steel after working under the hammer. But we always warned against continuing the hammering after the piece cooled. Now we have the proposition of increasing the endurance limit of steel 15 per cent by cold working the surface, but by rolling instead of hammering. We are learning more about metals every day.

Lowest Cost Not Always Best

WHEN we are all striving to reduce to the utmost the cost per piece of our products, it is a bit disturbing to have a well known economist point out that this may be all wrong in the small shop. And he backs it up by showing how this extreme economy is too frequently secured only by an investment that is too heavy for the small shop to carry safely.

This is a point that every small shop manager can study to advantage. Where the lowest possible cost per piece involves a heavy investment in special machinery, it is usually safer to pay a little more per piece and have a machine that can be used on other work as well. Even in competition with large concerns, it is frequently possible to offset the lower cost per piece at the machine by savings in other directions, such as overhead.

In other words, total costs must be balanced so that the apparent saving by a low cost at the machine may not be more than offset by interest charges which are always with us.

Too Much Shrinkage

MOST PEOPLE exaggerate in some form or other. If the doctor orders one pill a day, some think they ought to take two. So with shrink fits. The old rule of a thousandth to the inch didn't seem enough to one chap and so he gave it "plenty"; he wanted a good tight fit. The heat treater warned him it was too much, but he knew what he wanted. The ring he shrunk on the shaft was loose when it cooled. The large shrink allowance had stretched the ring beyond the elastic limit and the fit was spoiled. Moderation in all things, even shrinkage allowances, pays in the long run. —*J. R. G.*

Diameters and Areas of Small Drills

Number, letter, metric, and fractional drills in order of size

Number	Letter	Metric	Fract.	Diam. in Inches	Area Sq.In.
		.1		.0039	.0000119
		.15		.0059	.0000273
		.2		.0078	.0000477
		.25		.0098	.0000753
		.3		.0118	.0001091
80				.0135	.0001429
		.35		.0137	.0001468
79				.0145	.000165
			1/64	.01562	.000192
		.4		.01574	.000195
78				.0160	.000201
		.45		.0177	.000245
77				.0180	.000254
		.5		.01968	.000304
76				.0200	.000314
75				.0210	.000346
		.55		.0216	.000365
74				.0225	.000398
		.6		.02362	.000438
73				.0240	.000452
72				.0250	.000491
		.65		.0255	.000510
71				.0260	.000531
		.7		.02756	.000597
70				.0280	.000616
69				.02925	.000672
		.75		.0295	.000683
68				.0310	.000755
			1/32	.03125	.000767
		.8		.03149	.000779
67				.0320	.000804
66				.0330	.000855
		.85		.0334	.000871
65				.0350	.000962
		.9		.03543	.000986
64				.0360	.001018
63				.0370	.001075
		.95		.0374	.001091
62				.0380	.001134
61				.0390	.001195
		1.0		.03937	.001217
60				.0400	.001257
59				.0410	.00132
		.105		.0413	.001351
58				.0420	.001385
57				.0430	.001452
		1.1		.0433	.001473
		1.15		.0452	.001610
56				.0465	.001698
			3/64	.04687	.001726
		1.2		.04724	.001753
		1.25		.0492	.001900
		1.3		.051181	.002057
55				.0520	.002124
		1.35		.0531	.002206
54				.0550	.002376
		1.4		.0551	.002386
		1.45		.0570	.002544
		1.5		.0590	.002739
53				.0595	.002781
		1.55		.0610	.002921
			1/16	.0625	.003068
		1.6		.06299	.003116
52				.0635	.003167
		1.65		.0649	.003306
		1.70		.06692	.003518
51				.0670	.003526
		1.75		.0688	.003714
50				.0700	.003848
		1.8		.07086	.003944
		1.85		.0728	.004162
49				.0730	.004185
		1.90		.0748	.004394
48				.0760	.004536
		1.95		.0767	.004618
			5/64	.07812	.004794
47				.0785	.00484
		2.0		.07874	.004869
		2.05		.0807	.005112
46				.0810	.005153
45				.0820	.005281
		2.1		.08267	.005369
		2.15		.0846	.005615
44				.0860	.005809
		2.2		.08661	.005892
		2.25		.0885	.006149
43				.0890	.006221
		2.3		.09055	.006440
		2.35		.0925	.006715
42				.0935	.00686
			3/32	.09375	.006903
		2.4		.09448	.007012
41				.0960	.007238
		2.45		.0964	.007296
40				.098	.007543
		2.5		.09842	.007609
39				.0995	.007776
38				.1015	.008091
		2.6		.10236	.008229
37				.1040	.00849
		2.7		.1063	.008875
36				.1065	.008908
		2.75		.1082	.009189
			7/64	.10937	.009396
35				.1100	.009503
		2.8		.11024	.009544
34				.1110	.009677
33				.1130	.010029
		2.9		.11417	.010238
32				.1160	.010568
		3.0		.11811	.010959
31				.1200	.011310
		3.1		.12205	.011699
			1/8	.1250	.012272
		3.2		.12598	.012466
		3.25		.1279	.012802
30				.1285	.012969
		3.3		.12992	.013257
		3.4		.13386	.014073
29				.1360	.014527
		3.5		.1378	.014913
28				.1405	.015504
			9/64	.14062	.015531
		3.6		.14173	.015777
27				.1440	.016286
		3.7		.14567	.016666
26				.1470	.016972
		3.75		.1476	.017106
25				.1495	.017554
		3.8		.14961	.017579
24				.1520	.018146
		3.9		.15354	.018516
23				.1540	.018627
			5/32	.15625	.019175
22				.1570	.019359
		4.0		.15748	.019478
21				.1590	.019856
20				.1610	.020358
		4.1		.16142	.020464
		4.2		.16536	.021474
19				.1660	.021642
		4.25		.1673	.022056
		4.3		.16929	.022505
18				.1695	.022565
			11/64	.171875	.023202
17				.1730	.023506
		4.4		.17323	.023568
16				.1770	.024606
		4.5		.17717	.024652
15				.180	.025447
		4.6		.1811	.025760
14				.1820	.026016
13				.1850	.02688
		4.7		.18504	.026892
		4.75		.1870	.027457
			3/16	.1875	.027612
		4.8		.18898	.028048
12				.1890	.028055
11				.1910	.028652
		4.9		.19291	.029229
10				.1935	.029407
9				.1960	.030172
		5.0		.19685	.030434
8				.1990	.031103
		5.1		.20079	.031664
7				.2010	.031731
			13/64	.20312	.032403
6				.204	.032685
		5.2		.20473	.032918
5				.2055	.0331681
		5.25		.2066	.033520
		5.3		.2086	.034196
4				.2090	.034307
		5.4		.2126	.035499
3				.2130	.035633
		5.5		.21654	.036825
			7/32	.21875	.037583
		5.6		.22047	.038177
2				.2210	.038360
		5.7		.22441	.039552
		5.75		.2263	.040243
1				.2280	.040828
		5.8		.22835	.040952
		5.9		.23228	.042377
	A			.2340	.043005
			15/64	.23437	.043141
		6.0		.23622	.043825
	B			.2380	.044488
		6.1		.24015	.045299
	C			.2420	.045996
		6.2		.2441	.046797
	D			.2460	.047529
		6.25		.24606	.047548
		6.3		.24803	.048317
	E			.2500	.049087
		6.4		.25197	.049863
		6.5		.25591	.051434
	F			.2570	.051875
			1/4	.2598	.053028
	G			.2610	.053502
		6.7		.2637	.054648
			17/64	.2656	.055412
		6.75		.2657	.055414
	H			.2660	.055572
		6.8		.26772	.056291
		6.9		.27165	.057959
	I			.2720	.058107
		7.0		.2755	.059651
	J			.2770	.060263
		7.1		.2795	.061367
	K			.2810	.062016
			9/32	.28125	.062126
		7.2		.28347	.063108
		7.25		.2854	.06397
		7.3		.2874	.064874
	L			.2900	.066052
		7.4		.29133	.066663
	M			.2950	.068349
		7.5		.2952	.068477
			19/64	.2967	.069218
		7.6		.29922	.070315
	N			.3020	.071631
		7.7		.30314	.072178
		7.75		.3051	.073057
		7.8		.30709	.074065
		7.9		.31102	.075976
			5/16	.3125	.076699
		8.0		.31496	.077912
	O			.3160	.078427
		8.1		.31889	.079872
		8.2		.32283	.081856
	P			.3230	.081940
		8.25		.3248	.082781
		8.3		.3268	.083865
			21/64	.32812	.084558
		8.4		.3307	.085898
	Q			.3320	.086570
		8.5		.33465	.087955
		8.6		.33858	.090037
	R			.3390	.090259
		8.7		.3425	.092143
			11/32	.3437	.092806
		8.75		.3444	.092912
		8.8		.3464	.094274
	S			.3480	.095115
		8.9		.3504	.096428
		9.0		.3543	.098607
	T			.3580	.100660
		9.1		.3583	.100811
			23/64	.3593	.101434
		9.2		.3622	.103039
		9.25		.3641	.103986
		9.3		.3661	.105291
	U			.3680	.106362
		9.4		.3701	.107567
		9.5		.37402	.109868
			3/8	.3750	.110447
	V			.3770	.111628
		9.6		.37795	.112193
		9.7		.3818	.114543
		9.75		.3838	.115689
		9.8		.3858	.116917
	W			.3860	.117021
		9.9		.3898	.119315
			25/64	.39062	.119844
		10.0		.3937	.121738
	X			.3970	.123786
	Y			.4040	.128190
			13/32	.4062	.129622
	Z			.4130	.133965
		10.5		.4133	.13420
			27/64	.4218	.13972
		11.0		.4330	.14718
			7/16	.4375	.15033
		11.5		.4527	.16076
			29/64	.4531	.16124
			15/32	.4687	.17257
		12.0		.4724	.17490
			31/64	.4843	.18425
		12.5		.4921	.19014
			1/2	.5000	.19635
		13.0		.5118	.20507
			33/64	.5156	.20875
			17/32	.5312	.22166
		13.5		.5314	.22179
			35/64	.5468	.23412
		14.0		.5511	.23844
			9/16	.5625	.24850
		14.5		.5708	.25604
			37/64	.5781	.26248
		15.0		.5905	.27339
			19/32	.5937	.27688
			39/64	.6093	.29161
		15.5		.6102	.29224
			5/8	.6250	.30680
		16.0		.6299	.31172
			41/64	.6406	.32232
		16.5		.6496	.33081
			21/32	.6562	.33824
		17.0		.6692	.35142
			43/64	.6718	.36454
			11/16	.6875	.37122
		17.5		.6889	.37267
			45/64	.7031	.38828
		18.0		.7086	.39434
			23/32	.7187	.40574
		18.5		.7283	.41657
			47/64	.7343	.42356
		19.0		.7480	.43935
			3/4	.7500	.44179
			49/64	.7656	.45875
		19.5		.7677	.46283
			25/32	.7812	.47937
		20.0		.7874	.48686
			51/64	.7968	.49772
		20.5		.8070	.51158
			13/16	.8125	.51849
		21.0		.8267	.53685
			53/64	.8281	.53861
			27/32	.8437	.55914
		21.5		.8464	.56266
			55/64	.8593	.57992
		22.0		.8661	.58920
			7/8	.8750	.60132
		22.5		.8858	.61629
			57/64	.8906	.62297
		23.0		.9055	.64007
			29/32	.9062	.64504
			59/64	.9218	.66746
		23.5		.9251	.67222
			15/16	.9375	.69029
		24.0		.9448	.70119
			61/64	.9531	.71502
		24.5		.9645	.72979
			31/32	.9687	.73708
		25.0		.9842	.76144
			63/64	.9843	.76345
			1.0	1.000	.7854
		25.5		1.003	.79152

Metric drills in millimeters

Contributed by Lars S. Curry, Chief Draftsman, Wheeler-Schebler Carburetor Company
A contribution by Mr. Curry explaining some of the uses of this table appears on the preceding page.

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American Machinist

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Front Page News

WHAT has happened to industry? While the economists are creaking, and croaking, from theory to theory to answer that question, it might be timely, and far more profitable, to ask another. What is happening in industry? This question can be answered by practical men in the varied industries comprising industry; they alone seem to be aware of tremendous recent developments.

Let the electrical man speak. "We are fully prepared to bring about a reduction of thirty per cent in generating costs, and you all know what cheap power means. The mercury vapor turbo-generator is an economical actuality. Through the new science of electronics we have a host of practical new devices, all proved and waiting for application. The bulky, troublesome transformer is being replaced by a simple tube. The electrical industry more than doubled during the last decade. With cheaper current, imagine for yourself what it will do in the next."

The gas man. "Well, the biggest thing in our field right now is natural gas. We've found that it can be transported almost any distance at a maximum cost of four cents per thousand cubic feet per one hundred miles. Chicago is about nine hundred miles from the Texas wells; industrial gas costs six cents at the well plus thirty-six cents for transportation. Figure the rest out for yourself—forty-two cent gas with twice the B.t.u.'s of artificial gas. We're going to pipe through to New York City next."

The textile man. "Lord knows we've been bumping bottom longer than anyone, but it won't be much longer now. We're going in for new equipment; what's more, we're scrapping the old. One mill has just ordered thirteen hundred and four new looms and is breaking up all its old ones, literally smashing them. The individual dog-eat-dog policy is being replaced by co-operative planning. We're on our way, right."

The provisioner. "Quick freezing. That is our trump card. All foods packaged by the manufacturer. No waste. No spoilage. Why, we've known the time when a farmer would ship carloads of berries to the New York market and have them all dumped into the North River. No market. Nothing but unpaid freight bills for a whole season's work. With quick freezing, berries can be held until there is a market. Farmer, middleman, and housewife—all will get a break."

The chemist. "Bless you, we've hardly felt that there was a depression. Our business is flexible; just as soon as one thing palls on the market, our plants can shift over to another. Remember after the war? We took smokeless powder and turned it into automobile lacquer. If you're looking for something new, see what we're doing in plastics. We'll have you sitting in resinoid chairs clipping your coupons if you give us half a chance."

And, surprisingly enough, the retailer. "We're the next to be mechanized. If you mechanical people are on to your jobs, we've got work for you for years to come. For the first time we've been seriously trying out business devices—right now, one of our Pittsburgh stores is testing out a mechanical record control outfit that will let a half dozen girls do the work of twenty. The other fourteen can go to selling, right where they belong. We thought the department store was out of the race, but it was only getting its second wind."

Electrical man, gas man, and textile man, provisioner, chemist, and retailer—all in agreement. What *has* happened to industry, has happened. What *is* happening in industry, is the vital thing. Development heaped upon development, wonder upon wonder. Not one can be carried through without the versatile aid of the machinery and metal-working industry.

Will these new developments mean more technological unemployment? Not at all. Cheaper power permits the development of new products. More products mean more manufacturing. More manufacturing means more employment. Think. Where would unemployment be now without the countless new developments of the past three decades?

Let the followers of the castor-oil school of economics take their daily doses. Let the newspapers fill their front pages with depression, lust, and unemployment. What is actually happening behind the scenes in the key industries of the world is the genuine front page news.

SHOP EQUIPMENT NEWS

Milwaukee Simplex Milling Machines With Spindle Speeds to 1,000 R.P.M.

The Kearney & Trecker Corporation, Milwaukee, Wis., announces a production-type milling machine with spindle speeds as high as 1,000 r.p.m., basically designed for the higher cutting speeds and correct application of cemented tungsten-carbide cutters. Either of three standard speed ranges with 12 speed changes, is optionally furnished. These ranges are 15 to 150, 30 to 300, and 100 to 1,000 r.p.m.

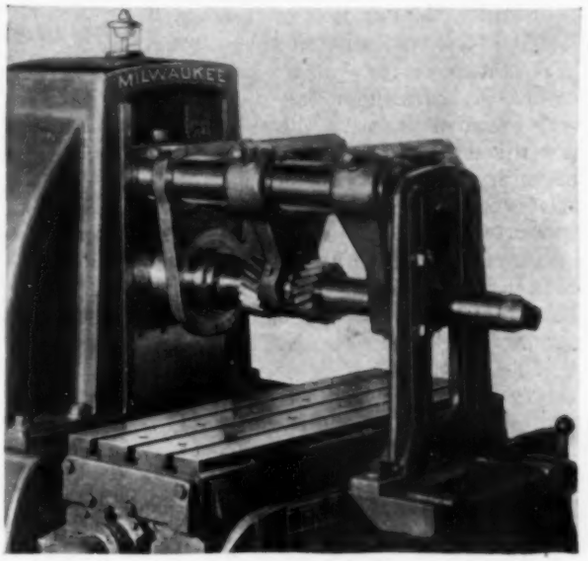
An innovation in spindle quill construction is accomplished through a heavy brace that ties the spindle quill to the double overarms. This member, mounted at the extreme end of the quill, provides a strong stiffening support throughout the entire cross adjustment. When the spindle quill is moved outwards, the quill brace goes with it, thus furnishing "adjustable rigidity" to the spindle and cutters.

The spindle quill is made from a steel forging, heat-treated, hardened, and ground. It is 7 in. in diameter and has 7 in. of longitudinal or cross adjustment. The quill is locked in the spindle block by two clamps located at the right-hand side of the spindle block uprights. Cross adjustment is by a handcrank attached to the squared end of the shaft, located midway between these screws, and provided with a graduated dial. One turn of the adjusting shaft moves the quill 0.250 in., the graduations being marked in divisions of thousandths of an inch.

The spindle drive is through heavy herringbone gears. The design differs from the usual practice: instead of splining the large spindle gear and having it slide on the spindle, this gear is solidly mounted on the spindle and its driving pinion is splined. This construction insures a positive drive to the spindle throughout the entire cross adjustment of the spindle quill.

The spindle is mounted on three large roller bearings. Two of these are of the tapered type located at the extreme ends of the spindle, and the third is of the straight design located on the inside hub of the spindle quill. The rear tapered bearing is mounted in the housing that surrounds the driven gear, and is permanently attached to the quill as an integral unit. This construction insures a smooth, free-running drive.

Extra strength for high cutting speeds is accomplished by mounting the spindle block between heavy



"Adjustable rigidity" of spindle and cutters is given by the quill brace moving with the quill

Five major units comprise the machine: bed, double uprights, spindle block, saddle, and table

double uprights. The block has bearing surfaces for its full length, being guided and aligned by a deep-tongued slide and held to adjustment with a full length gib. When the spindle block is clamped in place, the entire head becomes practically one solid unit. Vertical adjustment of the spindle block is by a handcrank located at the right side of the bed and convenient to the operator when setting the spindle either in or out, or up and down. A graduated dial, marked in thousandths of an inch, offers precision settings.

A feature of convenience is the coordinated adjustment for the arbor and overarm braces. When adjusting the cutters in or out, it is not necessary to disturb the independent relations of the arbor to the arbor supports and double overarms. The entire unit moves with the handcrank. It is necessary to loosen only the two bolts that clamp the overarms in the spindle block and the two bolts in the T-slots at the base of the outer arbor support, at the front of the bed.

An option of two ranges of 18 feeds is offered, either from ½ to 20 in. or from 1 to 40 in. per minute. The feed changes are made at the front of the machine by pick-off gears located behind a hinged door. The power rapid traverse operates at 240 in. per minute.

An unusual feature of the table is the method of mounting the table dogs that control the feed and rapid traverse movements. These dogs are located in a built-in compartment at the front side of the table. They are fully protected by a cover plate from all dirt and chips.

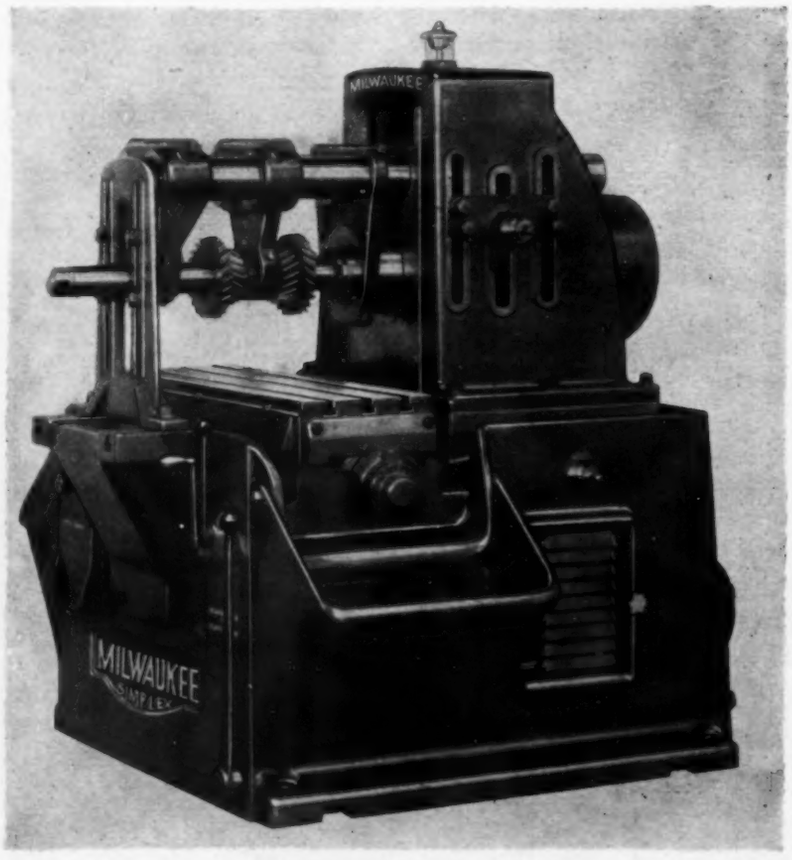
Milwaukee Simplex Machines are offered in two series—1,200 and 1,800—the first two numerals designating table widths. The 1,200 series machines have tables 12 in. in width, with a choice of either 18, 24, or 30 in. of table feed; and the 1,800 series machines have tables 18 in. in width with table feeds of 24 or 30 in. All tables are held in adjustment by a heavy gib running the full width of the bed.

Tables for 1,200 series machines have three T-slots spaced 3½ in. apart, and the 1,800 series machines have five T-slots, with the same spacing. All slots are $\frac{11}{16}$ in. in width to take ⅝-in. bolts. The tables are further provided with a series of self-cleaning workstop holes ¾ in. in diameter.

General Specifications of Simplex Models

	Series 1200	Series 1800
Table feed (power), in.	18, 24, or 30	24 or 30
Rate of power rapid traverse, in. per min.	240	240
Height of table above floor, in.	32	32
Working surface of table No. 1218, in.	12x36	.....
Working surface of table No. 1224, in.	12x42	.....
Working surface of table No. 1230, in.	12x48	.....
Working surface of table No. 1824, in.	.....	18x42
Working surface of table No. 1830, in.	.....	18x48
Number of feeds	18	18
Feed ranges (as specified), in. per min.	½ to 20 or 1 to 40	½ to 20 or 1 to 40
Number of speeds	12	12
Speed ranges (as specified), r.p.m.	15 to 150, 30 to 300, 100 to 1000	15 to 150, 30 to 300, 100 to 1000
Cross adjustment of spindle, in.	7	7
Face of spindle to center of table, min., in.	3½	6½
Face of spindle to center of table, max., in.	10½	13½
Vertical adjustment of spindle, in.	9	9
Center of spindle to top of table, min., in.	3½	3½
Center of spindle to top of table, max., in.	12½	12½
Diameter of spindle end (National Std.), in.	5 1/16	5 1/16
Center of spindle to overarms (underside), in.	6½	6½
Diameter of overarms, in.	4¼	4¼
Cutter coolant capacity, gal.	25	30
Overall height of machine, in.	60	60
Hp. of motor	5*	5*
Speed of motor, r.p.m.	1,750	1,750
Speed of main drive shaft and pulley, r.p.m.	600	600
Weight of machine, lb.	7300—7500—7700	8000—8300

*Can also be furnished with 7½ hp. motor.



Multiple V-belt drive in Milwaukee Simplex Production-Type Milling Machines affords smooth cutting at high spindle speeds

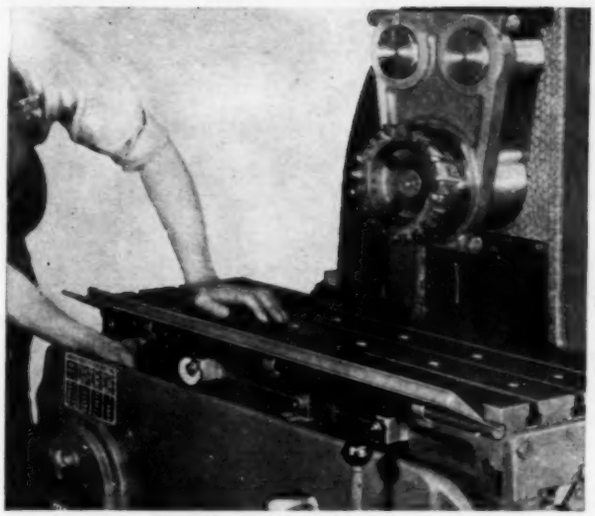


Table dogs are protected from dirt and chips by a hinged cover

Five major units comprise the machine: namely, the bed, the double uprights, the spindle block, the saddle, and the table. The bed of the machine, which is cast in one piece, contains all operating units, which include the motor, main driving clutch and brake, speed and feed gear units, coolant and lubricant pumps, and reservoirs. Through the introduction of a heavy bolted saddle, all operating units of the table can be self-contained and made readily accessible for both adjustment and maintenance. The saddle construction further eliminates the necessity of a large opening at the front of the bed and thus stiffens the entire bed casting.

With the exception of the outer bearings of the table screw, the entire machine is automatically lubricated by a geared pump. The pump is driven from the main drive shaft on the pulley side of the clutch, so that when the motor starts, the pump operates, thus distributing a bath of oil to all running parts. An oil line runs to the sight-feed gage at the top of the double uprights, which indicates that the lubricating system is in operation.

The coolant is distributed by a large gear pump that operates automatically when the spindle is engaged. The pump is constructed with a low-pressure release valve so that a large quantity of coolant can be flooded on to the cutters at low pressure. The pump is made as a self-contained unit and can be withdrawn from the machine by removing six screws. It is driven by a sliding gear that can be disengaged by a small lever. Coolant troughs are located at each end of the bed and project slightly beyond the table when it is at its outmost positions. The machine can be furnished without troughs and coolant pump, if desired.

The machine has a multiple V-belt drive consisting of four belts. The motor is mounted on a pivoted bracket that can be adjusted to keep the bolts at a proper tension. Air is forced through the motor compartment when the machine is in operation, to keep the motor at a proper temperature. All machines are arranged for motor drive to accommodate either 5- or 7½-hp. motors.

Net weights of the machine vary from 7,300 to 8,300 lb., depending upon bed and table sizes.

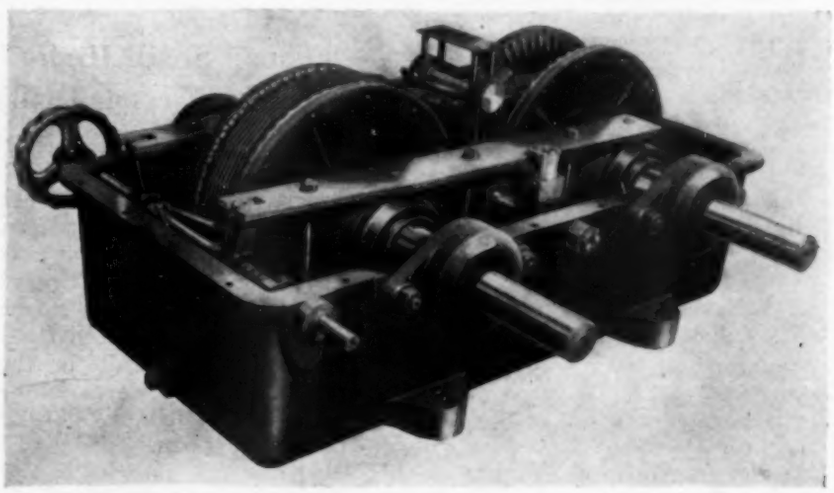
Link-Belt "P.I.V." Variable-Speed Transmission

An all-metal variable-speed transmission has been announced by the Link-Belt Company, Philadelphia, Pa. It is called the "P.I.V. Gear," the initials standing for "Positive Infinitely Variable."

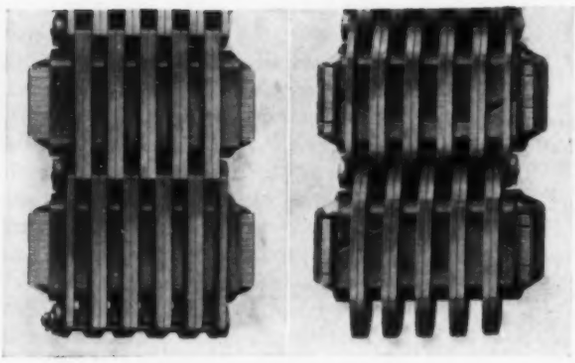
Basically, the unit consists of two pairs of wheels of the opposed conical disk type, between which a unique chain transmits power. The effective diameters of each pair of wheels can be altered under load to change the speed ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that while the input shaft connected to a motor or other source of power turns at constant speed, the output shaft is brought to the desired speed.

Variable-speed devices employing adjustable conical disks and belts with side friction contacts have been used for some time. The wholly original feature of the P.I.V. gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving disks, and the self-adjustable teeth projecting beyond the sides of the chain are arranged to engage positively the radial teeth of the disks.

The chain used in the P.I.V. gear is made up of a series of steel leaves or links with joints consisting of hardened steel pins turning in segmental bushings. There are no teeth on the inner surface of this chain. Instead, what may be called teeth are made up of packs of hardened-steel laminations or slats which extend through slots in the links at right angles to them, and project about ⅛ in. at each side of the chain. The individual containers which hold the packs of slats are secured in the openings of the links, but, within each such container, the slats are free to slide



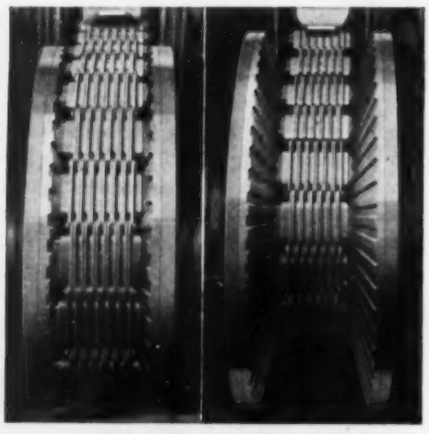
Link-Belt P.I.V. Gear (Positive Infinitely Variable), showing the compactness and the safety from fully inclosed construction



Top and bottom of P.I.V. Chain

from side to side individually with relation to each other and adjust themselves to engagement with the radial teeth of the disks, over substantially the full range of diameters. The angle of the slat ends, 30 deg., is the same as that of the conical faces of the wheels.

The teeth of the disks widen from the center outward toward the circumference, but are of uniform depth.



Left—Tooth formation of P.I.V. Chain at the maximum diameter of a wheel. Right—Tooth formation at the minimum diameter

They are so staggered relatively on each pair of wheels that the slats move back and forth into the teeth to mesh correctly as the chain comes into contact with the wheels. Self-pitching of the chain to any tooth width or wheel diameter is thus assured. At each engagement of the chain and wheels, the slats are regrouped within their separate containers, but do not slide nor move under working pull. Their movement in engaging with the wheels is completed before the load is applied.

All elements of the P.I.V. gear are built into a compact oil-tight housing, and are automatically splash lubricated. The hardened-steel wheel faces are mounted on cast-iron hubs backed by ball thrust bearings, and move axially on the shafts, which in turn are mounted in radial ball bearings. The movement of the pairs of wheels together or apart, in order to increase or decrease their effective pitch diameters, is controlled by a pair of pivoted levers operated through a hand control shaft with right- and left-hand screw motion. Initial chain tension is provided by an external adjustment screw, and correct operating tension is maintained at all ratio settings by two hardened shoes which ride lightly on both upper and lower strands of the chain, under constant spring pressure. A speed indicator permits ready check-up on operating speed settings.

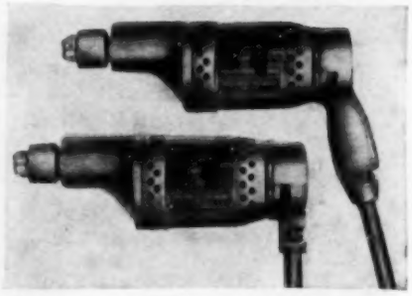
The P.I.V. gear is available at present in five sizes, from 1 to 10 hp. capacity, providing speed change ratios up to a maximum of six to one. It has been thoroughly tested throughout the past year by continuous operation in driving machine tools, textile equipment, baking, glass and paper-making machinery. By reason of its compactness and large range of speed variations, it has made possible desirable improvements in the design of several types of such machines.

A book, No. 1274, illustrating and describing the Link-Belt P.I.V. gear, is available.

"Thor" Small High-Frequency Electric Drills

Two styles of small electric high-frequency (180 cycles) drills for close-quarter operations are being offered to the trade by the Independent Pneumatic Tool Company, 600 West Jackson Blvd., Chicago, Ill. These two styles are the "Bonnet" and "Grip Switch," respectively.

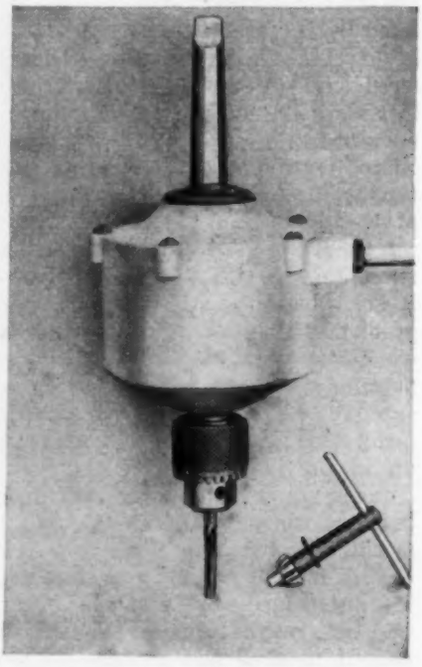
Both styles are made in three speeds, the bonnet style as follows: the AMC, illustrated, 2,300 r.p.m.; AMB, 2,790 r.p.m.; and AMA, 3,700 r.p.m. The capacity is $\frac{1}{4}$ in.; weight, 3 lb., and length over-all, $9\frac{1}{2}$ in.



The grip switch style is made in the AMC, illustrated, 2,300 r.p.m.; AMB, 2,790 r.p.m.; and AMA, 3,700 r.p.m. The capacity of this model is also $\frac{1}{4}$ in. Weight is 4 lb. 1 oz., length over-all, $9\frac{1}{2}$ in.

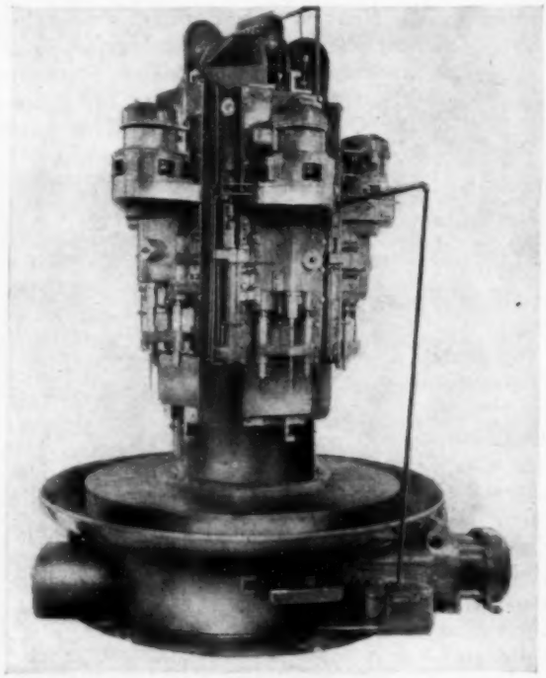
Procunier Tapping Attachment

High speed sensitive tapping can be done with this small tapping attachment in holes up to $\frac{1}{2}$ in. in cast iron and $\frac{7}{16}$ in. in steel. The attachment, announced by Procunier Safety Chuck Company, 18 South Clinton St., Chicago, Ill., features a "Double Cone" cork clutch, to give friction drive and friction reverse. The friction drive is regulated by the pressure on the drill press spindle, but slips immediately if the tap hits bottom or a hard place in the material is encountered. Two ball-thrust bearings are employed in the tool.



Fitchburg Five-Station, Four-Spindle Upright Drilling Machine

The $\frac{13}{16}$-in. distributer hole on the Ford cylinder block is finished on the type of drilling machine illustrated. The four operations require 36 sec. This five-station four-spindle machine, built by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass., is capable of other operations by changing the drum cam in the center of the machine and changing the fixtures. It is operated principally by electric controls and limit switches, thus eliminating a great deal of mechanism. Wherever power is required, a motor is applied as close to the demand as possible to eliminate bearings and shafts. Either ball bearings or roller bearings are supplied throughout, as required. Ball bearings and the slides are oiled automatically, except five which are grease lubricated by the pressure system. To provide neat appearance, the drive mechanism is located entirely within the base, thus conserving considerable floor space.



Rear view of the Fitchburg Five-Station, Four-Spindle Upright Drilling Machine, which can be changed for new work with minimum expense

The machine can be arranged for many other types of drilling. Drillheads can be equipped with multiple spindles for drilling a number of holes at the same time. Fixtures can be designed to hold more than one piece, depending of course on the nature of the work, so that the operator can load and unload more than one piece at each indexing.

The fixtures and Ford cylinder blocks are not shown in the accompanying illustration. In the set-up the distributor hole is drilled half-way at the first station, finish drilled at the second station, rough reamed and countersunk at the third station, and finish reamed at the final station. One block is drilled every 36 seconds. The table is indexed by a motor direct-connected to a worm drive in connection with an electric brake control and plunger. The drillheads are operated for the down feed and return by a barrel cam rotating in the center of the column. This cam is driven by a two-speed motor through a worm drive. One speed is for the feed and one for the rapid approach and return. Cam paths are cut in the barrel cam to provide the proper feeds for the work to be done.

Each drillhead contains an oil reservoir and is flood lubricated on each down stroke by a piston pump actuated by the movement of the head. The rest of the machine is oiled from a reservoir in the base, and the oil is pumped to the top of the machine and distributed from that point to the various bearings by an adjustable sight-feed oiling head. Drillheads are raised and lowered on their slides by means of roller chains passing over sprockets mounted at the top of the column.

The fixtures are designed for the work to be done and are attached to the rotary table. In the drillheads there are two spring-locating plungers that fit into bushings in each fixture, so that the drillheads and the fixtures will be kept in line. The approximate weight of the machine without fixtures is 40,000 lb.

"Mikrotast" Portable Steel Ball Gage

Both out-of-roundness and the diameter can be checked with the portable "Mikrotast" steel ball gage announced by the Coasts Machine Tool Company, Inc., 110-112 West 40th St., New York, N. Y. The fan-shaped, knife-edge indicator consists of a standard Krupp "Mikrotast" indicator, graduated in 40 divisions of 0.00005 in. or 50 divisions of 0.0001 in. This indicator connects with an adapter carrying a conical cup of Krupp "Nitralloy" at its lower end. The top of the cone is cut away to permit projection of the cone to the gaging contact point. The angle of the cone is 38 deg. 56 min., which is the only angle transmitting deviations

Krupp Mikrotast Steel Ball Gage, which has four adapters for balls from 0.400 to 1.200 in.

in size of the part under test in the exact ratio of 1 to 1 to the indicating hand. Thus, the possibility of inaccuracies being slightly exaggerated or minimized is eliminated.

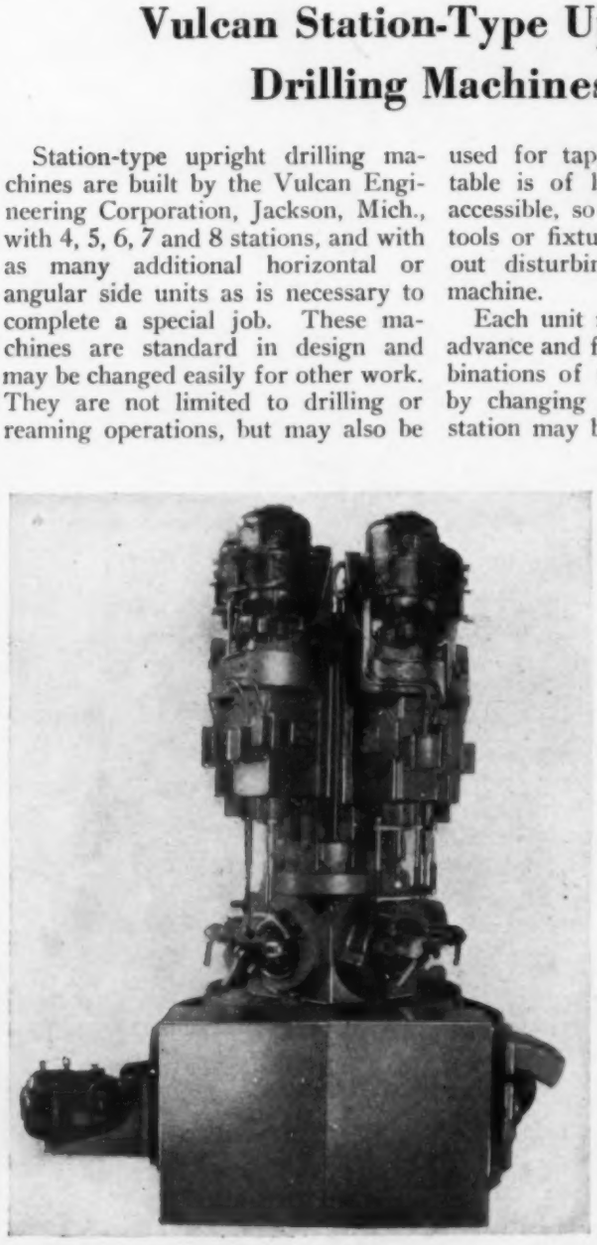
The gage is set to a master ball. Duplicate steel balls are then inspected by simply dropping the gage on the ball, allowing the gage to bear down by means of its own weight. On such inspection, it is common practice to employ a glass plate for the lower support, and by rolling the ball over this plate without raising the gage, any out-of-roundness to the fraction of a one-half ten-thousandth of an inch can be detected speedily. Red tolerance markers can be set and locked from without the case.

This gage is made with four adapters to cover the following diameter range: 0.400 to 0.520 in. (10 to 13 mm.); 0.520 to 0.680 in. (13 to 17 mm.); 0.680 to 0.920 in. (17 to 23 mm.); 0.920 to 1.200 in. (23 to 30 mm.).

Vulcan Station-Type Upright Drilling Machines

Station-type upright drilling machines are built by the Vulcan Engineering Corporation, Jackson, Mich., with 4, 5, 6, 7 and 8 stations, and with as many additional horizontal or angular side units as is necessary to complete a special job. These machines are standard in design and may be changed easily for other work. They are not limited to drilling or reaming operations, but may also be used for tapping and milling. The table is of large size and is easily accessible, so that a rapid change of tools or fixtures may be made without disturbing the balance of the machine.

Each unit may be timed for rapid advance and feed, or for various combinations of feeds and rapid return, by changing a pair of cams. Any station may be converted into a tapping station by substituting a tapping control switch for the drilling control switch. Indexing, as well as the timing for the indexing, is fully automatic and depends entirely on the longest operation used at any one station. As soon as the longest operation has been completed, the table is indexed one position and all units start work. The average time between the completing of an operation and the beginning of the next operation is 2 sec. This rapid indexing is accomplished without any jarring at starting or stopping, even though the tables weigh 2 to 5 tons.



Rear view of Vulcan Upright Four-Station Drilling Machine employing motorized Corwin unit heads

It is also possible to index fixtures automatically between operations. Any individual unit may also be arranged to do several operations by means of indexing the spindles during the time the other operations are being carried on. In short, such operations as single or multiple reaming, spot-facing, chamfering, small turning operations, tapping, end-milling, and various forms of straddle milling can be done.

Zeiss Improved 1 x 3-In. Toolmaker's Microscope

Heavier construction is found in the Zeiss toolmaker's microscope introduced in the United States by George Scherr Company, 142 Liberty St., New York, N. Y. This model retains the features of previous designs such as: the dial templet; smooth table movement guided by balls; a freely swiveling table top, and a quick-acting micrometer crank. The general design, Fig. 1, has been made more massive and sturdy, and longitudinal movement of table permits the use of gage blocks, whereby the range can be increased to 3 in. Micrometers are equipped with large direct and easy reading barrels, chromium-plated, with quick-acting cranks.

Fig. 1—Zeiss Improved Toolmaker's Microscope having cross travel of the table of 1 in., and longitudinal travel of 3 in.

The cradle for the centers and V-blocks can be clamped to the table, and centers and V-blocks are guided and clamped in semi-circular bea-

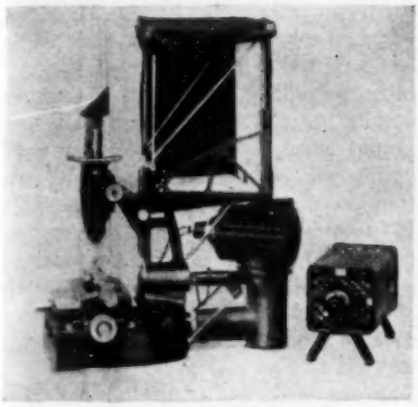


Fig. 2—Zeiss Toolroom Projector for comparing work against a drawing 30 times size

ings. The box-type column can be swiveled for bringing the microscope tube and illumination jointly into angular position for projecting the helix angle of a thread. By swiveling the microscope tube, the work on the table stays in the same position as when measuring the lead. Measurement of pitch diameter to within the limits of 0.0002 in. can be made.

The microscope tube is fitted with a prism, giving an erect, not inverted, image. Illumination can be either by daylight or from a self-contained lamp attached to the rear of the instrument.

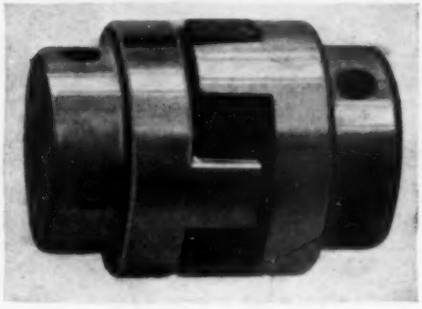
A special projection attachment, Fig. 2, for converting the instrument into a projector is available, making observation visible to both eyes from an image on the screen. The projector renders it possible to compare an image against a 30-times magnified drawing which can be made up easily to suit special work.

Specifications: Cross travel of table, 1 in.; longitudinal travel of table, 3 in.; magnification, 30 times; range of micrometers, 1 in.; graduation of micrometers, 0.0001 in.; reading of angles on universal ocular, 1 min.; reading of angles on dial templet, 10 min.

"L-R" Flexible Coupling

A coupling which transmits the load by compression of resilient, wear-resisting material has been developed by the Lovejoy Tool Works, 325 West Ohio St., Chicago, Ill. The "L-R" Multiflex resilient spider, which forms the driving medium between the halves of the coupling, is made up of a number of thin layers of highly resilient rubber vulcanized between layers of wear-resisting fabric. Contact is borne by the wear-resisting material. This type of construction is also oil-resisting. The spiders can also be furnished in laminated leather, wool-felt, molded rubber, fiber, and various other materials.

The over-all dimensions of the coupling are small so that flywheel effect is reduced to a minimum. With



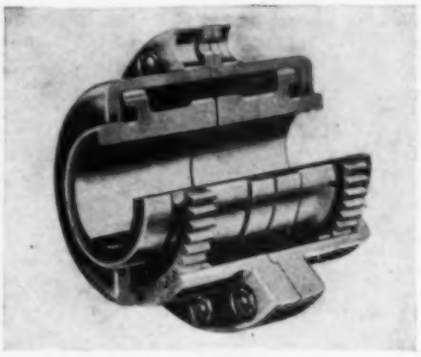
"L-R" Flexible Coupling with Resilient Spider

only three parts, it can be assembled quickly, and needs no adjustment nor lubrication.

Type A couplings for light machinery have standard stock bores from $\frac{1}{4}$ to $\frac{7}{8}$ in., carrying loads from 0.25 to 0.75 hp. at 100 r.p.m. Larger couplings for heavy machinery are available with bores from $\frac{1}{2}$ to 3 in. and capacities up to 30 hp. at 100 r.p.m. The couplings are designed to carry $2\frac{1}{2}$ times the full load of the heaviest electric motor of the same shaft size.

Poole Medium- and Light Duty Flexible Couplings

General features of the heavy-duty mill type flexible coupling manufactured by the concern also are found in the medium-duty coupling announced by the Poole Engineering & Machine Company, Baltimore, Md. Both the sleeves and hubs are machined from bars of high-carbon steel, sleeve members and end plates being integral. The construction is of the geared type, and the coupling will compensate for angular and offset misalignment. It is supplied with either countersunk or through bolts. The model illustrated is particularly suitable for light- and medium-duty



Poole Medium-Duty, Geared-Type Flexible Coupling, available in 1-, 1½- and 2-in. bores

service on drives for pumps, fans, small compressors, small generators, blowers, conveyors, and elevators.

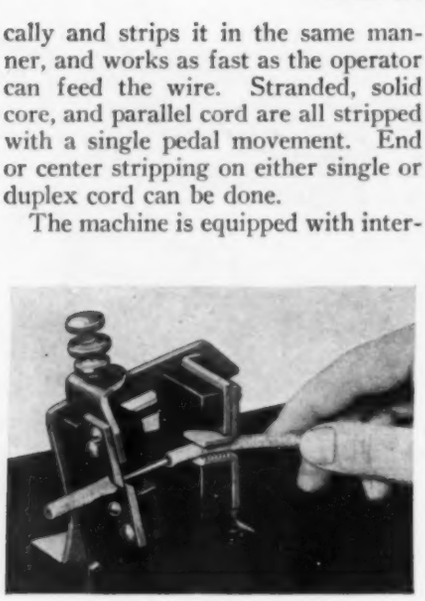
The coupling is available in three bores, 1, 1½ and 2 in., having horsepower capacities at 100 r.p.m. of 3, 8, and 20, respectively. The maximum speeds for these three couplings are 7,500, 6,000 and 5,000 r.p.m.

Ideal "E-Z" Wire Stripper

Rapid stripping of insulated wire from 12 gage to the finest magnet wire can be done on the "E-Z" wire stripper developed by the Ideal Commutator Dresser Company, Sycamore, Ill. An open-side feed is employed so that the work is constantly in sight. The machine grips the wire automati-

cally and strips it in the same manner, and works as fast as the operator can feed the wire. Stranded, solid core, and parallel cord are all stripped with a single pedal movement. End or center stripping on either single or duplex cord can be done.

The machine is equipped with inter-



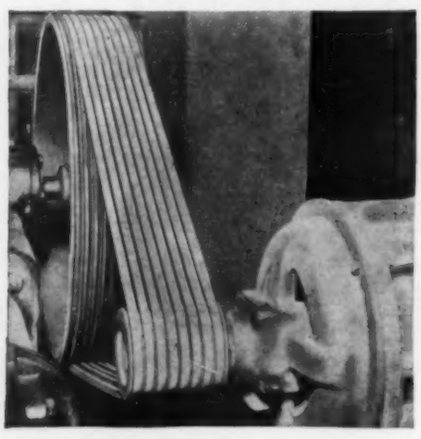
Close-up of the "E-Z" Wire Stripper Head, showing the open-side feed

changeable blades of the shearing type, either single V notch for single conductor or double VV notch for duplex cord. The size of the stripping hole in the blades is increased or decreased by a micrometer screw adjustment with locknut. The machine can be moved conveniently from place to place or mounted on a bench. Bench space required is 8x12 in., and floor space 18x18 in.

Medart V-Belt Drive

V-belt drive units of all standard designs and speeds can now be furnished by The Medart Company, 3500 DeKalb St., St. Louis, Mo. Sheaves for V-belts having a cross-section of $\frac{1}{2}$x$\frac{11}{32}$ in. are available in pitch diameters from 4 to 48 in., and with from 1 to 12 grooves. As the belt cross-section becomes larger, the sheave pitch diameters available also increase, the maximum in all cases being 96 in. In all cases not more than 12 grooves are available.

Medart V-belts come in standard lengths ranging from 35.98 in. for the shortest length of the smallest cross-section up to 1,200 in. for the longest length of the largest cross-section. Cross-sections range from $\frac{1}{2}$x$\frac{11}{32}$ in. to $1\frac{1}{2}$x1 in.



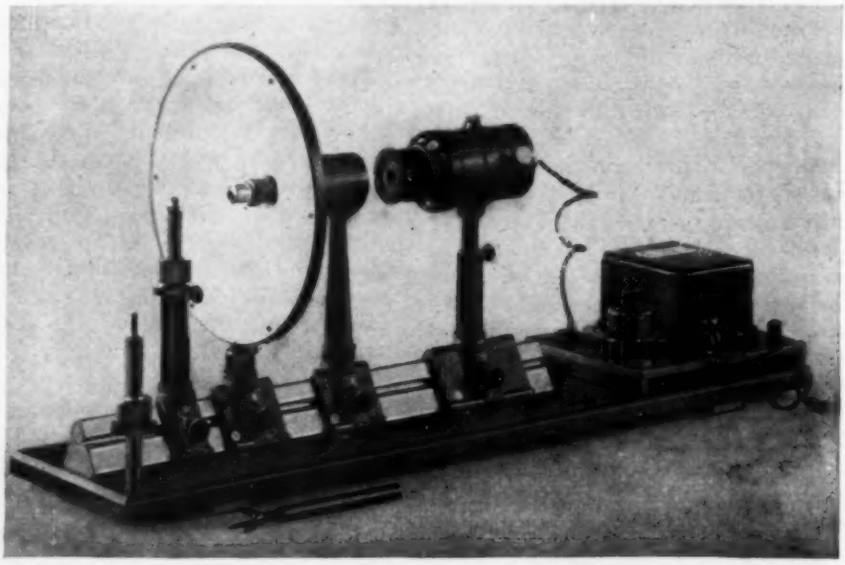
Zeiss Testing Instrument for Steel Balls and Rollers

Surfaces of balls and rollers may be inspected for defects in shape or finish on the Zeiss testing instrument illustrated. This equipment has been introduced into the United States by the George Scherr Company, Inc., 142 Liberty St., New York, N. Y. Suitable holders for large and small balls and rollers are furnished.

The light source is a 50-watt, 8-volt, incandescent lamp. To secure this voltage a rheostat is provided for direct current and a transformer for alternating current. The lamp casing is equipped with an adjustable iris diaphragm having a 5- to 8-mm. opening. An objective is supported within the beam of the light issuing from the diaphragm and concentrates the light to a sharp point a short distance away. After concentration the light rays form an intensely bright cone, in which the ball or roller is inserted to be inspected. The center of the ball must be placed exactly in the center of the optical axis. Small balls are placed close to the apex of the cone and larger balls correspondingly further away, so that the entire surface is fully illuminated. The ball rests on the holder, which can be rotated. In order to inspect the entire surface of the ball, the holder is turned once around the vertical axis and once around the optical axis.

Light reflected from the ball surface is projected onto a spherically shaped screen, on which a sharply focused image appears, disclosing all defects such as scratches. Errors in shape, that is flats, appear on the screen in the form of bright spots with black margins.

For testing rollers, the spherical screen is exchanged for a cylindrically shaped one, and rollers are tested by means of a rotating holder. The image of the cylindrical surface appears as an illuminated band, showing deviations from the cylindrical shape without distortion. Flats are shown by bright vertical lines.



A greatly enlarged image of the ball or roller in the holder is thrown upon the screen on the Zeiss Testing Instrument for Steel Balls and Rollers

Bunting Lead Hammer

For use in operations where steel or iron machinists' hammers may not be used safely, a $2\frac{1}{2}$-lb. lead hammer has been developed by The Bunting

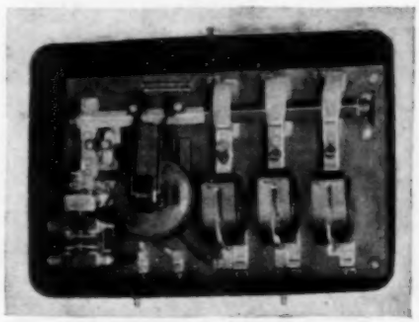
Brass & Bronze Company, Toledo, Ohio. The hammer head is securely assembled to a 10-in. steel handle. It supplements the line of copper-bronze hammers announced on page 412, Vol. 73, of *American Machinist*. Perfect balance and correct metallurgical composition of the head for machinists' use are claimed.

General Electric Type CR-2811 Magnetic Switch

For use on either a.c. or d.c. circuits, the General Electric Company, Schenectady, N. Y., has announced the CR-2811 magnetic switch, which is provided with a latch to hold the contactor closed. This condition is particularly desirable for conditions where: (1) the hum of a standard magnetic switch must be eliminated; (2) where the power consumed to hold the contactor closed by the usual method must be eliminated because of cost, and (3) where the switch must not open in case of coil failure, power failure, or short circuits.

The device consists of a two- or three-pole, a.c. contactor with a latching mechanism mounted on a base and with or without an enclosing case. The contactor is standard except for an extension of the shaft for the latching mechanism.

In operation, momentarily energizing the main contactor coil closes the contactor, which is then latched closed. Momentarily energizing the trip coil trips the latch and opens the contactor. Either a single-pole, double-throw knife switch or a two-button, normally-open, momentary-contact type of push button may be used for this purpose.



General Electric Type CR-2811 Magnetic Switch with latch mechanism

Clarktor Variable-Height Crane, which has capacity to lift 2,000 lb. to 13 ft.

Hammond "Select-O-Speed" High-Speed Grinder

Almost constant peripheral speed of 9,000 surface ft. per min. is given to the wheels of the "Select-O-Speed" grinder to give maximum grinding efficiency with Bakelite and rubber-bonded wheels. The machine, which is built by the Hammond Machinery Builders, Inc., Kalamazoo, Mich., can also be arranged for use with vitrified grinding wheels. Wheels of 24, 20, 18 and 16 in. in diameter can be used effectively, and a 7½-, 10- or 15-hp. motor can be supplied.

Power is transmitted from the motor mounted at the rear to an intermediate drive shaft by means of V-belts. Speeds are changed by means of quick-change pulleys on the motor. Power is transmitted from the intermediate spindle to the main spindle by means of herringbone gears, operating in an oil bath. Six oversize ball bearings afford smooth operation of the spindle. Wheel guards are made of boiler plate steel, and are adjustable to compensate for wear of the wheel. Shatterless glass eye shields are fitted. The motor is protected from overload, low-voltage, and phase failure by a Cutler-Hammer automatic motor starter.

Clarktor Variable-Height Crane

Capacity to lift 2,000 lb. to 13 ft. is found in the "Clarktor" variable-height crane announced by the Clark Tructractor Company, Battle Creek, Mich. When the boom is horizontal, the entire equipment has an over-all height of 7 ft. 10 in., making it easy to negotiate plant and warehouse doors. The crane is suitable for placing heavy castings and forgings on drill presses, lathes and other machine tools, and for handling heavy parts and machines in storage. It is also useful for handling heavy crates,

Hammond "Select-O-Speed" High-Speed grinder for snagging steel and malleable iron

bundles, boxes, and other loads requiring chains or hooks. It tiers such loads easily.

The chassis employed is the "Clarktor" tructractor, which has the short turning radius of 108 in. Standard truck transmission, a Clark truck axle, and a multiple-disk clutch are other features. The tractor-type gas engine uses 5 or 6 gal. of gas and a pint of oil daily.

TRADE PUBLICATIONS

DIESTOCKS. The Borden Co., Warren, Ohio, has issued a leaflet showing the various diestocks placed on the market in the past year. All types are illustrated and described.

FASTENINGS. The Parker - Kalon Corporation, 200 Varick St., New York, N. Y., has issued a booklet "Fastenings —How they are made by leaders in the metal working industries." The savings on several classes of work are cited, together with the advantages of Parker-Kalon screws.

GAGES AND INDICATORS. Frank E. Randall, Waltham, Mass., has issued a supplementary bulletin, as of September 1, 1930, on "Randall & Stickney Dial Gages and Indicators."

INSPECTED APPLIANCES. The Underwriters' Laboratories, National Board of Fire Underwriters, 207 East Ohio St., Chicago, Ill., has issued a "List of Appliances Inspected for Accident Hazard," as of October 1930.

PLATING MACHINES. The Meaker Co., 1615-1629 South 55th Ave., Chicago, Ill., has issued Bulletin 313 entitled "Meaker Full Automatic Straight-a-Way and Return-Type Plating Machines." Layouts and photographs of the equipment are given, together with the reduction in plating costs.

PATENTS

NOVEMBER 11, 1930

Metal-Working Machinery

Power Press. Robert Thompson and Alfred Morris Thompson, Newark, N. J. *Patent 1,781,038.*

Slip Spindle Device. Anton A. Herzberg, Waukesha, and Henry O. Schultz, Milwaukee, Wis., assigned to The National Automatic Tool Co. *Patent 1,781,109.*

Lubrication System for Shaping Machines. Hugo W. Jacobson, Arlington, N. J., assigned to Gould & Eberhardt. *Patent 1,781,110.*

Corner-Cutting Machine. George W. Klaucke, Worcester, Mass., assigned to Hobbs Manufacturing Co. *Patent 1,781,111.*

Hydraulic Broaching Machine. Francis J. Lapointe, Ann Arbor, Mich. *Patent 1,781,114.*

Mechanism for Making Molds. Earl F. Oyster, Cleveland Heights, and Francis N. Gilliland, Shaker Heights, Ohio, assigned to The Osborn Manufacturing Co. *Patent 1,781,126.*

Universal Ring-Rolling Machine. James Hall Taylor, Chicago, Ill. *Patent 1,781,140.*

Oiling System for Shapers. William F. Zimmermann, Maplewood, N. J., assigned to Gould & Eberhardt. *Patent 1,781,149.*

Power Gang Filing Device. Carl Winner, Hamtramck, Mich. *Patent 1,781,150.*

Die-Casting Machine. Edgar N. Dollin, Malba, N. Y., and Conrad C. Jacobson, Glen Ridge, N. J., assigned to John Robertson Co. *Patent 1,781,168.*

Sheet-Metal Folder. Frank J. Jarecki, Grand Rapids, Mich. *Patent 1,781,180.*

Lathe for Turning Crank Shafts. Herman O. Hess, Saginaw, Mich., assigned to General Motors Corporation. *Patent 1,781,228.*

Lathe for Turning Crank Shafts. Herman O. Hess, Saginaw, Mich. *Patent 1,781,229.*

Feed-Control Mechanism. William C. DeRoo, Cincinnati, Ohio, assigned to The Fosdick Machine Tool Co. *Patent 1,781,274.*

Power Press. William Klocke, Woodhaven, N. Y., assigned to E. W. Bliss Co. *Patent 1,781,397.*

Means for Making Double-Sided Molds. Gustav Eckstein, Barmen, Germany. *Patent 1,781,451.*

Machine for Slitting Sheets to be Stretched. Robert S. Allyn, Brooklyn, N. Y., assigned to Robert S. Allyn. *Patent 1,781,533.*

Tools and Attachments

Sanding Device for Motor Vehicles. William C. Martin, Boston, Mass., and Wallace Martin, Watertown, Mass. *Patent 1,781,120.*

Tapping Attachment. Harry G. Procunier, Chicago, Ill., assigned to Procunier Safety Chuck Co. *Patent 1,781,192.*

Valve-Reaming Tool. George E. Moen, Kelso, Wash. *Patent 1,781,338.*

Valve - Grinding Device. Rudolph Trahan, Rumstick Point, R. I. *Patent 1,781,417.*

Chuck. Arthur L. Currier, New Ipswich, N. H. *Patent 1,781,442.*

Pendulum Harness Tester. Emil Von Leesen, Berlin-Treptow, Germany. *Patent 1,781,615.*

Processes

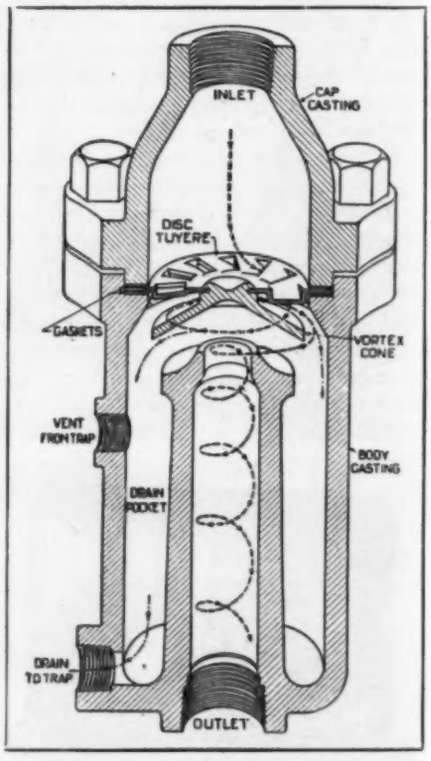
Method of Making Castings. James H. Williams, Detroit, Mich., assigned to Detroit and Security Trust Co. *Patent 1,781,143.*

"Centrifix" Compressed Air Cleaner

Moisture, oil, pipe scale, and other impurities in compressed air lines can be removed by means of the type RD compressed air cleaner announced by the Centrifix Corporation, 3029 Prospect Ave., Cleveland, Ohio. These impurities not only slow up production and spoil work, but also damage tools and equipment and spoil spray-painted work.

The "Centrifix" type RD compressed air cleaner utilizes centrifugal force to effect separation of the impurities in the air stream. Air enters the cleaner body through a "tuyère," which directs it in a spiral, whirling motion. Water and other impurities, being heavier, are thrown to the outer drain pocket while the clean air passes out through the central standpipe. A cone-shaped vortex breaker at the center separates out heavier particles. Suitable means must be provided to carry the water away. The most satisfactory arrangement is an automatic air trap.

The type RD is available for ¼- to 2½-in. pipe sizes.



Whirling motion of the compressed air in the "Centrifix" cleaner that separates out impurities

NEWS OF THE WEEK

First Annual Three-M Congress Scheduled in April

A MANAGEMENT, Maintenance, and Materials Handling Congress, as well as the Second National Industrial Equipment Exposition, will be held in Cleveland, Ohio, from April 13-18, 1931. At the time of the first exposition last March in Chicago, a Management Congress and Materials Handling meeting were also held, and so successful did the arrangement prove that it has been decided to expand the scope of the Congress to include maintenance. The whole is to be called the "Three-M Congress."

The materials handling portion of the meeting will be under the auspices of the A.S.M.E. Materials Handling Division and will constitute the Fourth National Meeting of that division. The American Management Association in the Society for Industrial Engineers will hold sessions during the Congress and it is expected that there will also be several other organizations holding meetings at that time. The maintenance program will be under the auspices of the Management Division of the A.S.M.E. and will be organized by L. C. Morrow, Editor of *Industrial Engineering*.

The Exposition will cover materials handling equipment in its broadest sense, including overhead floor and underground conveyors, trucks, tractors, cranes, and hoists. There will also be exhibits of engineering companies engaged in introducing improved production methods, time and labor-saving equipment, cost records, and equipment having to do with the reducing of waste. The entire arena and exhibit halls of the Cleveland Public Auditorium will be used for the exposition.

While each organization will be responsible for its own session, the entire program will be co-ordinated so as to cover the field extensively, and to give those in attendance considerable latitude in choosing topics of most value.

N. Y. Steel Treaters Discuss Carburizing

Three methods of carburizing were discussed by the N. Y. chapter of the American Society for Steel Treating held in the Woolworth Bldg. on Nov. 10. E. C. Moffett, of the American Cyanamid Company, described the merits of liquid baths, including the recent development of a new medium employing calcium cyanide as its active reagent, in place of the more familiar sodium cyanide. A deeper case and improved physical properties were claimed to result from the use of this material. E. C. Cook, of the American Gas Furnace Company, recounted the growing popularity of gas as a carburizer. He told of early difficulties in using gas in certain localities and the steps required to make such gases suitable for this service. Stanley P. Rockwell, of the Stanley P. Rockwell Company, reviewed some of the history of carburization and showed how the solid carburizer still held a place in the face of the other methods. While this process has developed little from its early use with charred bone and leather, it is advantageous in supporting intricate parts and in obtaining selective hardness. A general discussion followed the presentation of these papers.

A F. MASURY, Chairman of the Ordnance Advisory Committee of the S.A.E., called the twenty-third meeting of that committee in Cleveland, Ohio, on Nov. 17, 18, and 19. The executive session was held in the Cleveland district ordnance office on Nov. 17.

Inland Steel Develops Unemployment Plan

Employees of the Inland Steel Company have developed a plan for the relief of their fellow workers for whom no employment can be provided under present conditions. Those who are employed have voluntarily pledged a portion of their earnings to a relief fund, the company agreeing to contribute an equal amount. The contribution of the employees varies with their earnings from about 2 to 5 per cent. Employees earning less than $125 per month have not been asked to contribute, unless they are single with no dependents.

MACHINING A GIANT SOVIET PINWHEEL

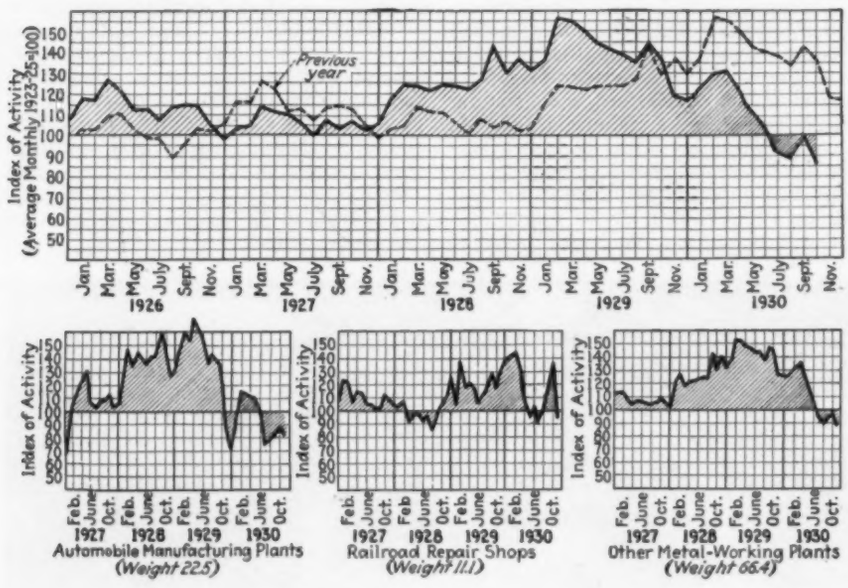
This 29½-ft. rotor spider, weighing 193,000 lb., will have a rim speed of 100 m.p.h. G.E. is building it for the 77,500-kva. Dneiper River Station of the U.S.S.R.

Commerce Department Makes Aircraft Estimate

Airplanes manufactured in the United States for civil use during the first nine months of 1930 totalled 2,154, according to an estimate by the Aeronautics Branch of the Department of Commerce. This estimate is based on a record of the licenses issued by the Department, identifications and reports as of Oct. 1 for aircraft manufactured since Jan. 1, 1930. In addition to the 2,154 aircraft manufactured for civil use, 556 military aircraft were delivered to the Army and Navy during this nine-month period. This brings a total estimated production up to 2,710.

Industrial Production Indexes Decline in October

RAILROAD repair shops led the general decline in industrial activity which occurred during October, according to latest reports received on the consumption of electrical energy for power purposes. Though September operations had shown a decided upturn from those of the previous month, the general index advancing from 88 per cent for August to 100.4 for September, the October decline more than equaled the previous advance. The September final figure for general metal working, adjusted for 26 working days, showed 99.6 per cent, while the revised preliminary figure similarly corrected for October shows 86.4.



The railroad shop index for September, adjusted for 26 days, was 136.1. This dropped in October to 96.0, adjusted for 26 working days. Ferrous and non-ferrous metal-working plants outside of automobile and repair shops had a September final index of 97.4 per cent, adjusted for the number of working days, while the October preliminary figure is only 87. The September final figure for automobile manufacturing plants similarly corrected is 88.4 and the revised preliminary figures for October show 80.9. The downward trend which started in March and continued on to July showed signs of a definite arrest in August, after reaching the lowest point since October, 1924. All preliminary figures for September showed definite advances except that for the automobile manufacturing plans, indicating that the downward trend had been definitely arrested and the upper trend begun. The October figures, however, throw the indexes below previous low points of this year.

Seasonal adjustments revise the figures slightly. The September final figure for railroad repair shops adjusted is 140.7. That for October is 97.4, while the metal-working index similarly adjusted declined from 98.7 in September to 88.8 in October. The automobile manufacturing index declined from 85.1 to 78.0. The general metal-working index, therefore, seasonally adjusted, declined from 100.4 to 87.3.

1931 Automobile Show To Open Jan. 3

Four exposition floors of the Grand Central Palace, New York, will be filled to capacity for the 1931 National Automobile Show from Jan. 3 to 10, according to a recent announcement. The Chicago section of the show will be held in the Coliseum from Jan. 24-31. The national shows in New York and Chicago are expected to prove a great spur to the automobile and accessory industry.

Soviet Lathe Production Up 47 per Cent

According to the "Economic Review of the Soviet Union," a report of the Supreme Economic Council indicates that the total industrial output in the U.S.S.R. for the year 1929-30 was almost double the pre-war production, as compared with the 58 per cent increase recorded in 1928-29. While production in large-scale industry showed a 24.2 per cent increase in volume over that of 1928-29, the enlarged program for the year was realized to the extent of only 95 per cent. Most industries fell somewhat behind the revised program.

Machine building came close to realizing the program. The manufacture of internal combustion engines showed an increase of 85 per cent over 1928-29, Diesel engines 40 per cent, locomotives 108 per cent, steam boilers 48 per cent, lathes 47 per cent. The situation in machine production is shown in the following table:

	Production, Units 1929–30	Per Cent Increase Over 1928–29
Internal combustion engines	9,652	85.5
Diesel engines	403	40.4
Turbines, steam	29	11.5
Turbines, water	48	—2.0
Automobiles	4,425	316.3
Locomobiles	431	108.2
Steam boilers	5,946	48.0
Lathes for metal work	12,162	46.8
Machines for working up fibers	50,443	100.7
Combing machines	781	82.9
Equipment for textile factories	5,409	8.1
Knitting and weaving machines	7,555	—42.9

The output of agricultural machinery was 54 per cent over that of last year and 4½ times greater than the pre-war production, although the output was only 90 per cent of the plans. There was an especially large gain in tractor output.

Patent Office Has Biggest Year

The year 1930, as shown by receipts for the ten months ending Oct. 31, is the biggest year in the history of the Commerce Department's Patent Office, according to Thomas E. Robertson, Commissioner. 1929 was the previous "peak" year, but up to Oct. 31 there have been received nearly 500 more patent applications than in the corresponding months of 1929, the number for that year being 75,402, as compared with 75,868 for 1930.

Underwood & Underwood

HON. MARCUS A. COOLIDGE
Elected Junior Senator from Massachusetts recently

A.S.A. to Review Standard Tolerances

The "Tentative American Standard Tolerances, Allowances, and Gages for Metal Fits" for general engineering work, presented to industry in 1925 by

its sponsor, the American Society of Mechanical Engineers, is to be reviewed.

Criticism of the "tentative" standards has been expressed by some manufacturers and others have simply ignored them. Among the criticisms has been one that actual manufacturing and tooling conditions have been ignored in favor of mathematical accuracy. Furthermore, it is felt that if the system is to serve all of industry, as it should, it must follow the practice of other standards, except the British, and also use a basic shaft system. Without this it is of no use to the manufacturers of power transmission equipment, because the tolerances on cold-rolled shafting, which they use in large quantities, are below the basic or nominal size. There is also conflict between the basic hole method and the method of sizing reamers.

The present idea is to revive the committee in co-operation with the American Standards Association and attempt to outline a system that will be acceptable to those who should use it. A meeting to effect a reorganization of the committee will be held on Dec. 5.

International Acetylene Association Meets in Chicago

THREE days, Nov. 12, 13, and 14, were devoted to the 1930 annual meeting of the International Acetylene Association, held in Chicago at the Congress Hotel. W. D. Flannery was elected president, and W. C. Keeley, Jr., vice-president. C. A. McCune, retiring president, becomes a director. Other directors elected are W. H. Luddington and G. B. Walker. J. B. Johnson, Chief, Materiel Branch, War Department, Wright Field, Dayton, Ohio, was awarded the Morehead Medal for original research and development in the application of welding to aircraft construction. The meeting opened on the morning of Nov. 12 with an address of welcome by Col. Robert I. Randolph, a response by Henry Booth, the President's address by C. A. McCune, and a keynote address by Marc A. Rose, managing editor, *The Business Week*.

A metal-working industries session was held that afternoon at which three papers and reports were presented, including "Production Welding by the Oxy-Acetylene Process," by Earl C. Booth, "Résumé of Production Welding," by L. R. Gurley, and an Oxy-Acetylene Committee report by E. A. Doyle. Mr. Booth's paper discussed principally the history of his company's use of the oxy-acetylene process, particularly in its relation to the welding of tubing. Mr. Gurley's paper gave a general history of the oxy-acetylene process, with particular attention to the production phases, and also presented a list of the industries wherein the process is now used on a production basis. Mr. Gurley predicted completely welded locomotives in the near future. Discussion brought out that welding railway passenger cars reduces weight, eliminates corrosion between plates, and gives a car without creaks and groans.

The committee report summarized progress in oxy-acetylene welding and cutting during the year just closed. Important developments include: two-stage regulators for individual cylinders to give constant gas pressure at the blowpipe, and the increase in the diameter and strength of welded pipe lines which has necessitated high-strength welding rods with the ability to produce welds with a tensile strength of 65,000 lb. per sq.in. Aluminum welding has been centered on increased use of the aluminum-silicon welding rods. The International Nickel Company is now recommending the use of borated acetylene to improve weld quality in nickel. The oxy-acetylene process is used in every aircraft plant in the country, and its use is increasing. Worn piston heads in locomotive cylinders and similar parts are now being built up by welding with manganese bronze. The Shorter Process for surface hardening steel has been given some publicity abroad; the metal is heated locally to a temperature above the critical range with an oxy-acetylene flame which moves across the material at a proper rate of speed, followed by a quenching medium such as a stream of water projected from a nozzle. Any desired hardness may be obtained by proper manipulation. The blowpipe is also being used for local cyaniding of small areas. Metal spraying is increasing. Manufacturers are preparing to weld high-pressure boilers as soon as present code restrictions are removed.

Thursday's meetings included a building session and building piping sessions. Friday morning's session was on Transportation, with papers on General Railroad Welding, Reclamation Welding and Cutting, Welded Aluminum in Tank Trucks, Commercial Aircraft and Welding, and the Oxy-acetylene Process in Shipyards. New officers were elected on Friday afternoon preceding the dinner.

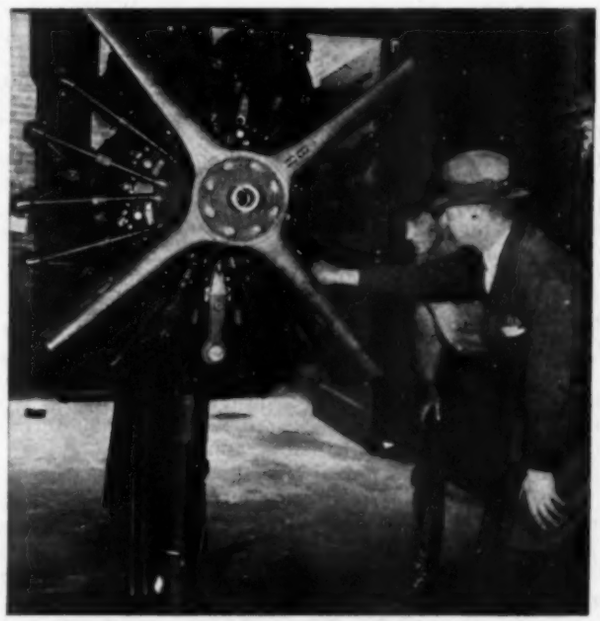
European Tariff Revision In Prospect

By Our Paris Correspondent

The Economic Committee of the League of Nations has decided to undertake a study of the European situation with respect to the manufacture of, and international trade in, textiles, tools, and machinery as being the items of international exchanges especially affected by existing tariffs. Other products will be included in later investigations. A general conference will be called for January, 1931, proposing new tariff negotiations for the general improvement of world trade. The later investigations will be on agriculture, live stock breeding and fisheries.

Two propositions have been set forth, one dealing with categories of merchandise, the other dealing with groups of countries. Great Britain was the sponsor for this plan of discussion, but Holland put forth a similar proposition, differing only as to procedure for arriving at the facts. The "most favored nation" clause of existing commercial treaties is considered the most difficult of reconciling with any new tariff régime which may be brought into being between groups of European countries. It is frankly stated that there is no hope of a new tariff régime without the approval of signatories and non-signatories of countries enjoying "most favored nations" treatment.

It may be mentioned that Edward A. Sumner, Director of the American Radiator Company, is a permanent member of the League's Economic Committee.



Hunting a Hornet's Buzz

A 10-hr. torque stand test, during which all performance factors are noted, is the lot of every Pratt & Whitney engine. Complete disassembly, part washing and minute inspection, then reassembly and a 2-hr. acceptance test follow

BUSINESS ITEMS

Directors of the Addressograph International Corporation and the American Multigraphing Co., Chicago, have approved plans for consolidation, and final action will be taken at a meeting on Nov. 25. The company, if plans are approved, will be called the Addressograph Multigraph Co., with Frank H. Woods as probable chairman of the board, while Henry C. Osborne, president of Multigraph, will become chairman of the executive committee. J. E. Rogers, president of Addressograph, will be president of the new company.

Twenty-eight cars of "Row Top" tractors, numbering 184, valued in excess of $200,000, comprised a "Prosperity Special" train which left the Oliver Hart-Parr factory in Charles City, Iowa, last Saturday, consigned to Dallas, Texas. In the latter city the train was met by a delegation of farm and business leaders. The Charles City tractor plant has meantime been shipping 50 tractors daily to Russia.

The Caterpillar Tractor Co., Peoria, Ill., last week shipped 1,500 large-type tractors comprising the $5,000,000 repeat order from the Soviet grain trust from the Peoria plant to the eastern seaboard. The first train of 22 cars was followed by 24-car trains daily until the whole order was cleared.

The Eccles & Davies Machinery Co., Inc., 316-322 South San Pedro St., Los Angeles, Calif., has been appointed agent for the Hollup Corporation, Chicago, Ill.

The Rheem Manufacturing Co., has purchased a factory site of eight acres in South Gate, Los Angeles, and will erect a brick and steel plant covering an area of 200x400 ft. The firm, which has its main office at Emeryville, Calif., has plants at Emeryville and Richmond.

The Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, is planning the establishing of stocks in different localities, the first to be opened in New York City to serve the Eastern and New England states. Further stocks will be located in Chicago and Dayton, Ohio. Drill jig bushings, ground thread taps, counterbores, and similar items will be carried in stock.

J. H. Williams & Co., Buffalo, N. Y., have closed contracts for an addition to the plant, to provide 30,000 sq.ft. floor space to be used for heat-treating, finishing, assembling, and storing.

The Larned Tool & Supply Co., 134 East Larned St., Detroit, Mich., has just been opened for business.

The Powers Accounting Machine Corporation, Kingston, Pa., has been consolidated with the Dalton Adding Machine Co., Norwood, Ohio, and the entire Powers plant, with about 100 employees, has been moved to Norwood.

The Pacific Pipe Co., 20th & Cypress Sts., Oakland, Calif., recently purchased an additional 40,000 sq. ft. adjoining the five acres which its plant now occupies. M. Jacobs is president of the firm; D. Pantoskey, treasurer, and P. J. Kramer, plant superintendent.

W. G. Weiss has taken over the inventory of the Scott-Weiss Steel Co., 110 S. Dearborn St., Chicago, and organized the Midland Steel & Equipment Co., 400-406 South Clinton St., Chicago.

PERSONALS

Lee F. Adams, commercial engineer of the General Electric Co., Schenectady, N. Y., has been awarded the Manufacturers Medal and Purse for 1930, given under the James H. McGraw Award. The recognition is the result of "outstanding and unselfish service to the manufacturing branch of the electrical industry."

Taylor Allderdice, formerly president of the National Tube Co., Pittsburgh, has been elected secretary and manager of the Carnegie Hero Fund Commission.

A. H. D. Altree, vice-president of the American Bosch Magneto Corporation, Springfield, Mass., has resigned effective Dec. 31, to retire from active business. He joined the Bosch Magneto Co., parent German company, in 1909, and has directed sales of the present concern since its formation in 1918.

S. F. Beall, who has been elected to the board of directors of the Continental Motors Corporation, is a former vice-president of the Packard Motor Car Co.

William E. Colley has resigned from the marine sales department of the Westinghouse Electric & Manufacturing Co., South Philadelphia Works, to become sales engineer with the Kingsbury Machine Works, Philadelphia, Pa.

R. G. Cooper has been appointed sales representative of the Bridgeport (Conn.) Brass Co., with offices in Cincinnati. He will cover the Louisville, Ky., Indianapolis, and St. Louis territory.

C. T. Dare has recently been added to the sales organization of the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit. He will work from the Dayton (Ohio) office covering Indiana and southern Ohio.

Donald R. Dohner, formerly instructor in design of the Carnegie Institute of Technology, Pittsburgh, has been appointed director of art of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Mr. Dohner will co-operate with the engineering department in designing electrical apparatus and machinery.

Clyde C. Elmes, formerly superintendent of the Baldwin Locomotive Works, Eddystone, Pa., was recently elected vice-president and general manager of the Dallett Co., Philadelphia.

Thomas F. Fawick, Akron, Ohio, has been elected president of the newly incorporated Fawick Manufacturing Co., Waukesha, Wis. The company has been incorporated by interests identified with the Waukesha (Wis.) Motor Co. with $300,000 capital to manufacture and market automotive units designed by Mr. Fawick. F. A. Perkins, Secretary of the Waukesha Motor Co., is vice-president, and C. L. Eason, of Detroit, is secretary-treasurer. Production of the line will be conducted in the Waukesha plant of the Hein-Werner Motor Parts Co.

John C. Chaffee, formerly assistant to the president, has been elected vice-president in charge of sales of the Wrought Iron Co. of America, Commercial Trust Bldg., Philadelphia.

A. J. Gerlach, advertising manager of the T. L. Smith Co., Milwaukee, has resigned and is establishing his own advertising agency with offices at 441 Broadway, Milwaukee.

C. F. Grimes, recently became president of the Romain Auto Service Co., St. Louis. He was formerly superintendent of assembly for the General Motors Co. of Brazil, at Sao Paulo, Brazil.

Conrad O. Hersan, formerly president of Hersan & Sherwood, Inc., Germantown, Philadelphia, Pa., has opened offices in Philadelphia, as a consulting engineer on sheet-metal products and production-tool problems.

E. J. Kearney, Secretary-Treasurer of the Kearney & Trecker Corp., Milwaukee, has been appointed representative of industry to the Wisconsin State educational board.

R. E. W. Harrison will present a paper entitled "Survey of Surface Quality Standards and Tolerance Costs, Based on 1929-30 Precision Grinding

Practice," at one of the Machine Shop Practice sessions during the A.S.M.E. annual meeting, Dec. 1-5, in New York.

M. L. Kerr has been appointed chief engineer of the Brockway Motor Truck Corporation, and will make his headquarters in Portland, N. Y., where engineering activities of Brockway and Indiana are being concentrated.

Victor O. Homerberg, Associate Professor of Physical Metallurgy at the Massachusetts Institute of Technology, author of several articles and books pertaining to metallography, and consulting metallurgist for several manufacturing companies, has been engaged by the Nitralloy Corporation, 52 Broadway, New York City, as technical director, starting Nov. 1.

William J. Ketcham has been appointed chief metallurgist of the Wisconsin Axle Co., a subsidiary of the Timken-Detroit Axle Co. He will be in charge of the company's laboratory at Oshkosh. He previously served as assistant to H. W. McQuaid, Timken chief metallurgist at Detroit.

H. E. Lewis, formerly executive vice-president of the Bethlehem Steel Corporation, Bethlehem, Pa., has been elected to the board of directors of the Jeffery Manufacturing Co., Columbus.

B. F. Mercer has been elected vice-president in charge of operations of the Union Steel Castings Co., Pittsburgh, a subsidiary of the Blaw-Knox Co. He was formerly general superintendent.

C. F. Messinger, Vice-President of the Chain Belt Co., Milwaukee, has been elected general manager. H. F. Greene, formerly with the Barber-Greene Co., Aurora, Ill., who joined the Chain Belt Co. in 1929, succeeds Mr. Messinger as general sales manager. Brinton Welser, formerly secretary, was elected a director and vice-president. J. C. Merwin was re-elected as vice-president. A. R. Abelt was elected secretary and continues in charge of chain sales. W. H. Brandt, formerly assistant secretary, becomes assistant to the president.

P. A. Mongerson has been appointed purchasing agent of the John Deere Tractor Co., Waterloo, Iowa, to succeed J. L. Cramer.

Gottfrid Olson, formerly foundry superintendent for the Illinois Malleable Iron Co., Chicago, who has for the past three years been general manager of the Katrineholm works of the Pump Separator Co., Stockholm, Sweden, has returned to Chicago and is again associated with the Illinois Malleable Iron Co.

B. D. Spofford, formerly advertising manager of the Waco Aircraft Co., has joined the Duriron Co., Inc., Dayton, Ohio, as advertising and publicity manager, as of Nov. 1.

R. L. Stickny, who has been designer and artist for Le Baron, Inc., has associated himself in a similar capacity with the J. B. Judkins Co., Merrimac, Mass.

William B. Stout, Detroit, well-known aircraft engineer, was the guest of honor at the monthly dinner meeting of the Milwaukee Section of the S.A.E., for Wednesday evening, Nov. 5.

T. R. Swenson has joined the sales department of the Midwestern Tool Co., Chicago. He was previously with the Danly Machine Specialties Co., Chicago, for seven years.

J. S. Whyte, Vice-President and General Manager of the MacWhyte Wire Rope Co., Kenosha, Wis., has been named a member of the State board of vocational education by Gov. Walter J. Kohler of Wisconsin.

R. N. Woods, formerly vice-president of the A. C. Woods & Co., Rockford, Ill., has been elected president to succeed the late A. C. Woods. L. N. Woods, formerly secretary-treasurer, has been elected vice-president and H. C. Woods has been elected secretary-treasurer, as well as director to fill a vacancy on the board.

OBITUARIES

William G. Carlin, 61, formerly associated with Thomas Carlin Sons Co., Pittsburgh, died at his home near Salem, Ohio, on Nov. 8.

J. A. Colby, 60, founder and head of the firm of Colby & Christie, Philadelphia, died unexpectedly on Nov. 12. He founded the engineering firm in 1912.

T. Coleman du Pont, former United States Senator from Delaware, former president of the Du Pont Powder Works, and at one time manager of the Johnstown Steel Co., Johnstown, Pa., died on Nov. 11, at Wilmington, Del.

Joseph W. Gaskill, 54, for 20 years purchasing agent for John A. Roebling's Sons Co., Trenton, N. J., died on Nov. 4 in Philadelphia after an operation.

Charles M. Eddy, 52, president of the R. M. Eddy Foundry Co., 372 West Grand Ave., Chicago, died on Nov. 10 while adjusting the motor of his car. He had been president for eight years.

James M. Hollowell, 60, Vice-President and General Manager of the Spalding Foundry Co., Atlanta, Ga., died at his home in Atlanta, after a brief illness, on Oct. 29.

Henry Lang, 66, Vice-President of the Ingersoll-Rand Co., New York, died at his home in Montclair, N. J., after a long illness. His business interests included the foreign trade firm of Lang-Kidde Co., New York, and the Island Service Co. of Nantucket.

John A. May, 71, formerly with the American Fork & Hoe Co., Ashtabula, Ohio, died on Nov. 9, in San Diego, Calif.

John E. Perry, 52, Chairman of the Board of the Valley Mould & Iron Corporation, Youngstown, Ohio, dropped dead of heart disease on Nov. 12. He was president of the company until two years ago.

George E. Purple, 66, President of the Flexible Steel Lacing Co., Chicago, since its organization in 1907, died on Nov. 3 at La Grange, Ill.

Charles H. Sterling, 80, head of the Sterling Manufacturing Co., Silver Creek, N. Y., died recently in Buffalo following a long illness.

Captain Harry E. Sullivan, 40, New York District Manager for the Manley Division, American Chain Co., died in Boston on Oct. 26 following an operation for appendicitis.

R. P. Tracy, President and General Manager of Manning, Bowman & Co., Meriden, Conn., committed suicide on Nov. 14.

Edward C. Waldvogel, 60, retired vice-president of the Yale & Towne Lock Co., died on Nov. 13 of pneumonia at his home in New Rochelle, N. Y. He had been with the company for about 30 years.

FORTHCOMING MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Calvin W. Rice, executive secretary, Engineering Societies Bldg., 29 West 39th St., New York, N. Y. The following meetings are scheduled:

Fifty-first annual meeting, Engineering Societies Bldg., Dec. 1-5.

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Materials Handling Meeting and Management congress, Cleveland, Ohio, Apr., 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

TAYLOR SOCIETY—Annual meeting, Dec. 3-5, Pennsylvania Hotel, New York City. P. E. Henderson, Associate Secretary, 29 West 39th St., N. Y. C.

NINTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING—In Grand Central Palace, New York City, Dec. 1-6. Charles F. Roth, manager, Grand Central Palace.

WESTERN METAL CONGRESS AND EXPOSITION—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

THREE-M-CONGRESS — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18, 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., New York.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

CINCINNATI

Machine tool manufacturers merely plodded along last week. In some cases there was a small gain, but in most there was no change in the sales curve. Selling agents report a limited demand. The week's bookings were largely confined to single items, as were the inquiries, requirements being well diversified. At this time only a small percentage of the inquiries received are resulting in sales.

CLEVELAND

No material change has been evident in the local machine tool market in the past two weeks. Business continues dull and spotty with only a few orders for single pieces and replacements being closed. Purchase of two tools by Chevrolet was the feature. Everyone seems busy on quotations, but only a small amount of this is materializing.

Business in automatics is faring better, because of the placing of additional orders for export to Russia. Punch and shear business continues firm. A dealer recently quoted on $60,000 worth of punch and shear orders.

DETROIT

Conditions in the machinery and machine tool trade here remain unchanged, and there is no indication that the general upturn of business will be reflected soon in the automobile industry. While it is true that some of the large automobile manufacturers have resumed and increased their operations, this does not mean that they will be in the market for machinery and tools.

A few thousand more men have been reemployed within the last ten days and indications point to a further increase in employment. A better feeling is evident throughout the business and industrial structure. November sales are not expected to be any better than those for October, which were low.

NEW ENGLAND

A fairly steady distribution of small tools and orders for single machine units at about the October level describes conditions in the New England market thus far in November. As a whole the situation is dull and featureless.

Dealers in used machines report dull trading with prospects encouraging. Small plants are anticipating requirements usually attended to in the inventory period. This brings a feeling of a slight pickup in this particular field. Manual training requirements should develop some orders from several cities before long. Boston closed bids this week for metal-working lathes for this purpose. A Massachusetts electrical company placed a good order for grinding machines but the grinding machinery demand is substantially below normal.

PHILADELPHIA

Prospects for the future are bright but present-day sales continue negligible here. One or two bright spots were discovered, but for the most part there was a woeful lack of business, and the inquiries were not indicative of early buying.

Most dealers and manufacturers do not look for resumption of quantity buying until the new year. Most of them feel that it will be several months into 1931 before there is a resumption of orders. However, optimistic feelings prevail.

This is based upon the fact that most of the inquiries now are coming from industrial plants seeking prices and delivery dates. There are also some indications that some of the railroads will shortly be in the market for early purchases.

■

PUTTING up shutters, banking the cellar with boughs, and shutting off the parlor for a long, hard winter, prospective tool buyers seem content to sit by the fireside 'til spring comes 'round again, despite their low woodpiles and empty cider barrels. Meanwhile, equipment cider in machine tools builders' plants awaits a market, and purchasers will learn, just as trusting neighbors do, that cider left with someone else may be gone when it is needed to take care of company. Prospects continue to ask if any cider is left, but keep on hoping it will develop a fabled pre-Volsteadian kick later on.

CINCINNATI sales and inquiries are all of the single-tool variety. Cleveland reports a two-tool purchase by Chevrolet, sales of automatics to Russia, and firmness in punches and shears. Detroit expects little business from automobile manufacturers, even though they have added a few thousand men and an ounce or two of optimism. New England's market is steady though dull, the used tool market being similarly affected, though there are some school orders and a pickup is anticipated. Philadelphia expects some railroads in the market soon, but places the general rise after the first of the year.

NEW YORK remains quiet, though some railroad equipment is being purchased. Milwaukee's orders are for single replacement tools, with the market tone more encouraging. Chicago's torch of optimism is a bit dimmed, with inquiries showing a falling off. Buffalo, on the contrary, feels optimistic, with inquiries coming up and single-tool sales reported. Southern District buyers are becoming more plentiful, all centers appearing strengthened after three quiet quarters.

SOUTHERN DISTRICT

Scattered activity in the machinery and machine tool market developed the past fortnight. While orders were of a miscellaneous type and far below the level of last year, the upward trend after three quarters of inactivity offers an encouraging outlook for the early months of 1931. With the exception of the Birmingham district, which continued quiet and practically unchanged, all centers of activity in the South appeared strengthened. Inquiry for woodworking machinery featured the Houston market, while the trade in the New Orleans area was so scattered as to be unclassifiable. Further business was reported out of Florida, an encouraging sign in view of the depressed condition of recent months. Mills and railroads have bought little.

MILWAUKEE

Conditions in the local machinery and machine tool market show very little change during the past two weeks. While the tone of the market is more encouraging and inquiries continue plentiful, actual sales are still limited, although reflecting slow progress toward improvement. Whatever business is being placed is well distributed as to industries, with the exception of automotive and agricultural.

While November is expected to show an improvement over the preceding month and further reflect the month-to-month slow improvement that has marked the local situation since summer, the volume is disappointing. General business conditions in this territory do not indicate a sound basis for a marked improvement for some time.

BUFFALO

While there is little in the way of recent orders to report from the Buffalo machine tool dealers, the tone is comparatively optimistic. One house reported the sale of a radial drill, and minor orders were reported by various others. Inquiries during the first two weeks of November were somewhat better than in October. While most of them involved single pieces of equipment, there was sufficient total volume to make them of interest.

Business is slow in the electrical equipment field. This is also true in the sales of contractors' equipment. There have been several lean months here and no immediate prospect of an improvement. The early deep snowfall of mid-October caught highway and street authorities totally unprepared. It is understood that the purchase of 44 snow plows is on the schedule for Erie county.

NEW YORK

Last week's steady quiet continues with most dealers, orders being still of the single-tool-for-replacement variety. One dealer sold a power bending brake, and others report small sales, but little real change is expected before the New Year and new budgets. Inquiries, much maligned lately because of their tendency to be just inquiries, showed some increases, though orders result not from inquiries but from leads and hard steady plugging. The Atchison, Topeka, & Santa Fe is going to place orders for 1,500 cars to cost almost $5,000,000. The Erie has purchased 11 oil-electric locomotives, and will soon receive four 1,000-hp. tugs and 360 freight cars of various types. Deliveries already made include some 2,150 cars. The $75,000,000 worth of orders for steel mill equipment, which George T. Ladd intimated would soon be forthcoming, have as yet made no appearance.

CHICAGO

Decreasing inquiry for machine tools since the first of this month is reported. An occasional order for one or two standard tools is mentioned, but conditions in the main are at the same low level that has characterized the market for the last several months. It had been hoped that an upward trend would be indicated with the advent of colder weather, but this hope has not been realized, and the torch of optimism has become rather dimmed. With the exception of the Chicago Board of Education, which is preparing a big equipment estimate for the new Lane Technical High School now under construction, nothing is reported to be in prospect in the way of shop requirements. Dealers in used tools complain that orders are few and far between, and that competition has brought prices down to the bottom notch.

BUSINESS • BAROMETER

A revival of activity may be expected as soon as the machinery of employment distribution is perfected

THEODORE H. PRICE
Editor, Commerce and Finance, New York

A CHANGE in price is sometimes a result of the necessities of the buyer or the seller, but in most cases the price level reflects public opinion and goes up or down accordingly. The much-sought solution of the price equation is, therefore, entirely dependent upon the popular interpretation of the facts.

The foregoing is peculiarly applicable to last week's markets. In the fore part of the week most of them declined. On the Stock Exchange securities were lower because it was feared that those who owned them were losing confidence in their immediate future. Commodity prices were also lower, and for the same reason. There are a few exceptions to this statement, notably rubber, but they are not numerous.

In the second half of the week a sharp change in sentiment quickly reversed the trend of prices, especially in stocks. In so far as the change can be ascribed to any one cause, the news that world-wide curtailment of copper output was being arranged by the leading producers was probably responsible. The heavy buying of the metal that followed caused an advance to 11 cents a pound, and when the copper shares on the Stock Exchange stiffened the shorts interpreted the event as handwriting on the wall and began to cover.

But it would be a mistake to conclude this early that public opinion has completely changed with respect to the commodities. The best evidence is that most buyers are still cautious. Speculation is being re-attracted to the staples, but those who might be purchasers are still disposed to procrastinate.

Business is keeping up fairly well. October sales of the mail-order houses, the department stores, and the chain stores will probably show an average reduction of about 7 per cent. In making this comparison the money value of the goods sold is used, and it is quite possible that the total would have run ahead of last year if the volume of the business passing rather than the money value of the goods sold had been taken into consideration.

These details are not, however, important. The country is richer than it was eighteen months ago when the stock market was booming. The change that has since occurred reflects the public mood. Just as soon as it becomes optimistic rather than pessimistic, we will see a revival of business that will probably carry us to dangerous altitudes unless we restrain ourselves. Just now there are many securities that are selling below their intrinsic value, and many commodities that may be bought for less than the cost of production. To the trained dealer in either securities or merchandise, many opportunities are now being offered. They are attractive, but they should not be embraced without the advice of experts who are honest and well-informed. Purchases made upon such advice should ultimately show a profit, although patience may be necessary.

Less has been heard of unemployment since the election. Doubtless there are many jobless men in our greater cities, but in the country there is lots of work for those who are willing to take it. Building is holding up a little better than usual at this time of year, and automobile production is being slightly increased because two of the larger companies have begun work on new models. Small dealers' stocks are the basis of a somewhat better feeling in the industry, and the same is true among the tire people, who believe with reason that the market in 1931 may require a larger output than even in 1929. The steel industry is still lagging, and little recovery is expected in the heavy industries generally until after the holidays. But reports from textiles continue encouraging.

In the newspapers it is asserted that bond issues aggregating over $400,000,000 were authorized on Election Day by the various states and municipalities which had to get the authority of their respective electorates for such issues. It is also estimated that an additional $400,000,000 is available for the cost of the public improvements that have been planned and authorized, and that taken all together not less than $1,000,000,000 is now at the disposal of the duly constituted authorities for public improvements of one sort and another. It is stated that the work on most of these improvements can be continued during the winter, and it is expected that the money put into circulation will go a long way to relieving the distress caused by unemployment.

These figures are having a definite effect upon those who have studied the situation closely, and many of them insist that a revival of activity may be expected just as soon as the machinery of job distribution has been perfected.

There is but little change to report in the European situation or in the Orient.

THE BUSINESS WEEK

November 19, 1930

WITH business opinion obviously content to throw away the last two months of this year, there is nothing surprising in the continued decline of general business activity to lower levels week after week as the period of even normal seasonal stimulus passes. . . . Our preliminary index for the week ended November 8 fell further, from 81.5% of normal to 79.3%, and is evidently still feeling for the bottom in waters never before tested but probably deeper than any heretofore sounded in past depressions. . . . Declining industrial activity is pulling it down more than general trade, and this fact lends some support to the hope that the lower it goes the sooner it will turn up. . . . That hope would be stronger if this country had only itself to consider, or if there were more immediate promise of prompt and vigorous result from the conferences of central bank heads now going on in Europe. . . . Where the wave of uncontrolled deflation has not carried them too far, commodity and stock prices are still being washed down with the tide, but the resistance of cotton and the upturn in copper are encouraging signs of at least temporary reaction. . . . The courageous determination of the automobile industry to stake something on next year is a heartening gesture of leadership where it has never failed us. . . . If financial leadership would now conquer its fatalism sufficiently to support the tottering bond market, the patient could feel more comfortable and more confident of a moderately merry Christmas and a happy New Year.

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THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

LIVELIER inquiry is noted in strip-steel and sheets among mid-western automotive industries. Another favorable feature is that stocks of steel in consumers' warehouses at the forthcoming inventory period, will probably be the smallest in years. Demand for scrap is at a standstill and this reveals the underlying weakness of the market. Price of shapes, plates and mild-steel bars has definitely crystallized at $1.60 per 100 lb., base, Pittsburgh, with concessions negligible. Prices are lower this week, for tin, zinc, antimony and solder at warehouses in principal buying centers. The advance, Nov. 12, of 0.5c. per lb., to 10c., on wholesale copper, was the first rise to occur in nearly six months. The increase, due to demand, will shortly be reflected in quotations on small lots of copper products out of dealers' warehouses.

(All prices as of Nov. 14, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90@2.00	3.35†	3.00	3.40†
No. 12	1.95@2.05	3.45†	3.10	3.45†
No. 14	2.05@2.15	3.55†	3.20	3.50†
No. 16	2.15@2.25	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2.30@2.40	3.75†	3.55	3.85
No. 24	2.35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.30	3.65†	3.65	3.55
Nos. 12 to 14	2.40	3.75†	3.75	3.65
No. 16	2.50	3.85†	3.85	3.75
No. 18	2.65	4.00†	4.00	3.90
No. 20	2.80	4.15†	4.15	4.05
No. 22	2.85	4.20†	4.20	4.10
No. 24	3.00	4.35†	4.35	4.25
No. 26	3.25	4.60†	4.60	4.50
No. 28	3.50	4.85†	4.85	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—½	⅝	¾	⅞	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin., flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 5/16-in. thick by ¾-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—3/32, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			10.75
Tin, Straits, pigs, New York			28.00@29.00
Lead, pigs, E. St. Louis	4.95	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.37½	New York	5.75@ 6.75

	New York	Cleveland	Chicago
Antimony, slabs	9.50@10.50	10.50	10.75
Copper sheets*	19.25	19.25	19.25
Copper wire*	11.25	11.37½	11.37½
Copper, drawn, round*	17.75	17.75	17.75
Copper tubing*	21.62½	21.62½	21.62½
Brass sheets, high*	16.62½	16.62½	16.62½
Brass tubing, high*	21.50	21.50	21.50
Brass rods, high*	14.87½	14.87½	14.87½
Brass wire, high*	17.12½	17.12½	17.12½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	22.25	21.50	20@22

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	47.00
Commercial genuine, intermediate grade	34.00
Anti-friction metal, general service	30.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	7.75 @8.00	7.25	7.25@ 7.75
Copper, heavy, and wire	7.50 @7.75	7.00	6.75@ 7.25
Copper, light, and bottoms	6.75 @7.00	6.50	6.00@ 6.50
Heavy lead	4.00	4.00	3.00@ 3.50
Tea lead	2.00	2.50	2.00@ 2.50
Brass, heavy, yellow	4.50 @4.75	5.00	4.00@ 4.50
Brass, heavy, red	6.75 @7.00	8.25	6.25@ 6.75
Brass, light	3.50 @3.75	4.00	3.50@ 4.00
No. 1 rod-brass turnings	4.50 @4.75	4.00	4.00@ 4.50
Zinc	2.00	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb	.14	38.00 per M	.14½
Sal soda, per lb.	.01½	.02	.02
Roll sulphur, per lb.	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.098	.104	.108
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.036
Brass rods	per lb.	.1487½	.1562½	.2125
Solder (½ and ½)	per lb.	.2225	.2275	.2975
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.60
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%*	65%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	.90	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.60
Coke, prompt foundry, per net ton	Connellsville,		3.50@4.85
White lead, dry	100 lb. kegs	New York,	13.75
White lead, in oil	100 lb. kegs	New York,	13.75
Red lead, dry	100 lb. kegs	New York,	13.75
Red lead, in oil	100 lb. kegs	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Conn., New London—Treasury Dept., Washington, D. C., J. A. Wetmore, Supervising Archt. —will receive bids until Dec. 5 for traveling cranes and hoists for Coast Guard Academy here.

Ill., Springfield—Hummer Plow Works—power-driven 42 in. square shear for shearing steel No. 18 gage or lighter.

Mass., Newton (Boston P. O.)—L. A. Anderson, 171 Charlesbank Rd.—miller, 2 in. belt.

Mass., Somerville (Boston P. O.) — P. P. Plourde Refrigerator Co., 15 Glen St.—sander, tractor type, a.c.

Mich., Detroit—Firestone Tire & Rubber Co., Main St., Akron, O.—equipment for automobile tire and wheel service and general service station for proposed 4 story building at Trumbull Ave. and Vernor Highway. Estimated cost $250,000.

Opportunities for Future Business

Ark., Little Rock—Wright Motor Co., 400 Center St., plans a 2 story, repair and service garage. Estimated cost $100,000. Petter & McAninch Inc., Pyramid Life Bldg., archts.

Calif., Alameda—City to donate tidelands to Federal Government on which the latter will establish an air depot, including an expenditure of $243,000 for depot sl..ps, etc.

Calif., Oakland—F. L. de Sanno, 4337 East 10th St., is having plans prepared for the construction of a 1 story, 90 x 110 ft. machine shop and brass foundry at Peralta and 19th Sts.

Conn., New Britain—Eastern Malleable Iron Co., Inc., 63 John St., will receive bids about January for a 2 story factory. Estimated cost including equipment $40,000. M. J. Unkelbach, 52 Main St., Archt. Noted Oct. 2.

Conn., New London—Treasury Dept., J. A. Wetmore, Supervising Archt., Washington, D. C., will receive bids until Dec. 5 for the construction of a group of buildings, including garage and storage building, etc., at Coast Guard Academy here.

Fla., Tampa—Tampa Shipbuilding & Engineering Co., South Water St., is having plans prepared for the construction of new floating drydock including repair facilities, etc. W. T. Donnelly, 247 Park Ave., New York, Engr. Maturity about Jan. 1.

Ill., Chicago — Wabash Ry. Co., Exchange Bldg., St. Louis, Mo., awarded contract for addition to Landers Yard round house to improve locomotive servicing facilities at West 79th St. and South California Ave., here. Estimated cost $33,000. W. R. Bennett, St. Louis, Ch. Engr.

Ill., Galesburg—Standard Oil Co. of Indiana, W. H. Caldwell, Mgr., plans the construction of a 1 story, 56 x 528 and 52 x 87 ft. plant, including garage, etc., on Cherry St. Estimated cost $30,000. Schlinz & Bailey, 53 West Jackson Blvd., Chicago, Engrs.

Ind., Hartford City — Overhead Door Corp., plans a 1 story addition to factory for the manufacture of garage doors and hangers. Estimated cost $50,000.

Ia., Cedar Rapids—County Auditor, will soon award contract for the construction of a shop building. W. H. Behrens, Co. Engr.

La., Alexandria—Tri-State Culvert Mfg. Co., manufacturers of corrugated iron culverts and kindred products, plans a 1 story plant. Estimated cost $30,000.

Md., Baltimore—Caroline Foundry Co., 723 South Caroline St., will soon award contract for a 3 story addition to plant for the manufacture of semi-steel and gray iron castings. Estimated cost $45,000.

Md., Baltimore—L. E. Mitchell Inc., 915 East Monument St. (heating contractors), will build a 2 story, 74 x 140 ft. plant to include machine shop at Cecil Ave. and 25th St.

Mass., Arlington—Stuart Marshall Realty Co., 825 Beacon St., Newton, will receive bids until Nov. 21 for the construction of a 1 story addition to service garage at Broadway and Alton St. here. C. S. J. White, 825 Beacon St., Newton, Archt. Noted Nov. 6.

Mass., Charlestown (Boston P. O.) — A. J. Wilson, c/o B. Brown, 65 Franklin St., Boston, Archt. and Engr., is receiving bids for the construction of a 1 story, 90 x 130 ft. addition to service garage at 39 Miller St. here. Estimated cost $40,000.

Mass., Springfield—Springfield Hospital, H. A. Fields, awarded contract for the construction of a 2 story, 60 x 200 ft. service building at Springfield nad North Chestnut Sts. Estimated cost $160,000.

Mich., Jackson — Sparks-Withington Co., plans an addition to factory for the manufacture of radio equipment, automotive products, etc. Estimated cost $45,000.

Mich., Lansing — Commonwealth Southern Corp., is having plans prepared for a 2 story automobile service building, repair shop and garage. Estimated cost including equipment $100,000. Allied Engineers Inc., Jackson, Archts. and Engrs.

Minn., Minneapolis—Bd. of Public Welfare, City Hall, plans the construction of an industrial plant at Parkers Lake. Estimated cost $50,000 to $100,000. Architect not announced.

Mo., St. Louis—Flexwood Co., 919 North Michigan Ave., Chicago, Ill., and c/o R. E. Pickrel, 4025 Clara Ave., St. Louis, postponed indefinitely construction of veneer manufacturing plant at Clara Ave. and Terminal Belt Line. $250,000. Noted Nov. 13.

Neb., Lincoln—International Harvester Co., 606 South Michigan Ave., Chicago, Ill., will soon award contract for a 1 story, 110 x 145 ft. factory, service and distribution plant here. Estimated cost $125,000.

N. H., Concord—Boston & Maine R.R., Boston, Mass., plans additions to heavy repair shops here. Estimated cost to exceed $40,000. W. J. Backes, Boston, Ch. Engr.

N. H., Conway—Conway Motor Car Co., F. Egan, plans reconstruction of service garage and repair shop recently destroyed by fire. Estimated cost $50,000. Architect not selected.

N. J., Newark—Beacon Upholstering Co., c/o Siegler & Greenberg, 164 Market St., Archts., postponed 2 story, 100 x 160 ft. factory at Belmont and Hawthorne Aves. $75,000. Project abandoned. Noted Oct. 30.

N. J., Plainfield — Public Service Co., Ordinated Transport Terminal Bldg., Newark, awarded contract for the construction of a 1 story, 100 x 170 ft. addition to garage, here. Estimated cost $150,000. Noted Oct. 23.

N. J., South River—Seawood Corp., 16 West 61st St., New York, N. Y., plans the construction of a yacht building plant at William St. and South River here. Estimated cost $40,000. Architect not selected.

N. J., Trenton—Alice C. Henderson, 17 North Willow St., plans the construction of a 3 story garage at 50-52 West Hanover St. Estimated cost $30,000.

N. Y., Albany — American Express Co., awarded contract for a 100 x 110 ft. garage on Sheridan Ave. Estimated cost $25,000.

N. Y., Brooklyn—H. Goldin, 1539 East 16th St., is having preliminary plans prepared for the construction of a garage and service station, etc., at 16th Ave. and West 45th St. Estimated cost $85,000. J. J. Millman, 67 Court St., Archt.

N. Y., Brooklyn—D. H. Leoman, 89-15 187th St., Hollis, plans the construction of a garage at 54th St. and 21st Ave. Estimated cost $50,000. J. A. Boyles, 367 Fulton St., Archt. Maturity in February.

N. Y., Brooklyn—One Thousand Eight Pitkin Ave. Corp., A. W. Norek, Pres., 66 Court St., will receive bids about Feb. 1 for the construction of a 4 story service garage, etc., at Pitkin Parkway and Eastern Parkway. Estimated cost to exceed $75,000. H. J. Nurick, 44 Court St., Archt. Noted Nov. 13.

N. Y., Brooklyn—Lynkings Realty Co., W. Zorn, Pres., 1366 White Plains Rd., New York, is having preliminary plans prepared for the construction of a garage at New Utrecht and 18th Aves. Estimated cost to exceed $70,000. F. H. Klie, 250 Park Ave., New York, Archt.

N. Y., Brooklyn—M. Solomon, Morgan Ave. and Scholes St., is having preliimnary plans prepared for the construction of a service garage. Estimated cost $40,000. B. Sockheim, 26 Court St., Archt.

N. Y., Long Island City — General Bronze Corp., 34-19 10th Ave., plans unification of facilities to single plant. Estimated cost $500,000 to $1,000,000. Maturity in January.

N. Y., Schenectady — General Electric Co. (Refrigeration Division), River Rd., plans the construction of a refrigerator manufacturing plant. Estimated cost to exceed $40,000.

N. C., Burlington—Sykes Foundry Co., Maple Ave., plans to rebuild part of machine shop destroyed by fire. $25,000.

O., Cincinnati—Buckeye Foundry Co., 2257 Buck St., received lowest bid for a 1 story, 120 x 280 ft. foundry on Bekman St. from D. Meinken & Son, 2143 Barnard St. Estimated cost $150,000.

O., Columbiana—U. S. Standard Mfg. Co., awarded contract for the construction of a 1 story, 60 x 105 ft. factory at Railroad and Spruce Sts. Estimated cost $33,000.

Okla., Oklahoma City—City plans an election soon to vote $250,000 bonds for the construction of a garage and repair shop.

Okla., Tulsa—Nicholson Clock Co., 3109-15 West 5th St., awarded contract for a 1 story, 40 x 95 ft. plant for the manufacture of clocks and clock mechanisms. Estimated cost $30,000.

Pa., Philadelphia—Nicetown Mfg. Co., 4250 Wissahickon Ave., awarded contract for a 1 story addition to factory for the manufacture of iron and steel specialties.

Tenn., Cookeville—Bd. of Education, Nashville, awarded contract for the construction of an industrial arts building here. Estimated cost $185,000.

Vt., Barre—Rock of Ages Corp., will build a 1 story, 65 x 260 ft. cutting plant. Estimated cost $75,000. Work will be done under the supervision of L. F. Caproni & Co., 1044 Chapel St., New Haven, Conn., Archts.

Wis., Milwaukee—Federal Pressed Steel Corp., 50 Keefe Ave., is having plans prepared for a new power plant, initial installation will consist of stoker, fired high pressure boilers, ultimately electrical generating equipment will be added.

Wis., Sheboygan—Milwaukee Electric Railway & Light Co., 217 Michigan Ave., will receive bids until Nov. 24 for a 1 and 2 story, 40 x 180 ft. freight terminal and motor bus garage, here. F. Luber, c/o owner, Archt.

Wis., Stevens Point—Water Dept., is having plans prepared for a 2 story, 40 x 70 ft. mechanical shop, storage building and office. Estimated cost including equipment $25,000.

Ont., Gravenshurst — Rainbow Boat Works, Ltd., awarded contract for the construction of a 75 x 250 ft. factory and shops for the manufacture of motor boats. Estimated cost $100,000. Noted Nov. 13.

Ont., Fort William — Bd. of Education, awarded contract for the construction of a 3 story, 175 x 200 ft. technical school. $411,875. Noted Oct. 23.